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**DEPARTMENT OF DEFENSE AUTHORIZATION FOR
APPROPRIATIONS FOR FISCAL YEARS 1990 AND
1991**

HEARINGS

BEFORE THE

**COMMITTEE ON ARMED SERVICES
UNITED STATES SENATE**

ONE HUNDRED FIRST CONGRESS

FIRST SESSION

ON

S. 1085

AUTHORIZING APPROPRIATIONS FOR FISCAL YEARS 1990 AND 1991 FOR
MILITARY ACTIVITIES OF THE DEPARTMENT OF DEFENSE, FOR MILI-
TARY CONSTRUCTION, AND FOR DEFENSE ACTIVITIES OF THE DE-
PARTMENT OF ENERGY, TO PRESCRIBE PERSONNEL STRENGTHS FOR
SUCH FISCAL YEARS FOR THE ARMED FORCES, AND FOR OTHER PUR-
POSES

PART 6

STRATEGIC FORCES AND NUCLEAR DETERRENCE

MARCH 6; MAY 10, 31; JUNE 8, 12, 13, 14, 15, 1989



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**DEPARTMENT OF DEFENSE AUTHORIZATION
FOR APPROPRIATIONS FOR FISCAL YEARS
1990 AND 1991**

MONDAY MARCH 6, 1989

**U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC FORCES
AND NUCLEAR DETERRENCE,
COMMITTEE ON ARMED SERVICES,
*Washington, DC.***

**DEFENSE NUCLEAR AGENCY'S NUCLEAR WEAPONS
EFFECTS TESTING**

The subcommittee met at 2:34 p.m., in room SR-222, Russell Senate Office Building, Senator J. James Exon (chairman of the subcommittee) presiding.

Committee members present: Senators Exon, Thurmond, Wallop, and Gorton.

Professional staff members present: William E. Hoehn, Jr. and T. Kirk McConnell.

Minority staff members present: Robert F. Bott, Brian D. Dailey, and George K. Johnson, Jr., professional staff members.

Staff assistant present: Mickie Jan Wise.

Committee members' assistants present: Jeffrey B. Subko, assistant to Senator Exon; Donald A. Mitchell, assistant to Senator Glenn; James M. Bodner, assistant to Senator Cohen; Jack D. Crouch II, assistant to Senator Wallop; and Robert M. Soofer, assistant to Senator Gorton.

OPENING STATEMENT OF SENATOR J. JAMES EXON, CHAIRMAN

Senator EXON. The subcommittee will please come to order. The subcommittee meets this afternoon to receive testimony from the Defense Nuclear Agency nuclear weapons testing requirements program. The purpose of this hearing is to enlighten members of the committee and the Senate as a whole on DNA's role in and use of underground nuclear testing.

The Congress has received testimony on underground nuclear testing issues, primarily from the Department of Energy. This emphasis overlooks the fact that DOE's missions and requirements are different from those of DNA and that DNA's effect testing mission is no less extensive and important than that part of the Department of Energy.

Whereas the Department of Energy conducts underground testing to validate weapons' design and yields, the Defense Nuclear

Agency is responsible for determining the effectiveness of those weapons as well as the susceptibility of our other critical systems, such as reentry vehicles, missiles, MIRVs and their supporting C³ and early warning sensors to various nuclear effects.

Considering proposals for a comprehensive test ban or for very low yield thresholds, the Congress has weighed all requirements for testing as well as the range of potential alternatives thereto. Specific issues that need to be addressed today include, first, the extent to which full system or major subsystems are, as opposed to small components thereof, and certainly those small components thereof must be subject to nuclear effects and the impact of such system level test on the required test yields; second, the need for tests on high yield reliability to establish the effectiveness of weapons against hardened targets; and, third, the potential for non-nuclear test simulations and the inertial confinement fusion program to dispense with or reduce the need for underground effects testing.

The committee is also interested in obtaining DNA's view on the degree to which DOE faithfully subjects critical weapons systems and supporting C³I elements to rigorous effects from testing and analysis.

With us today to address these and other subjects are Dr. Marvin Atkins, Deputy Director of DNA, and Dr. Don Linger, who manages DNA's Test Directorate. On behalf of the committee I wish to extend you a warm welcome.

At this time I would like to ask any other member of the committee if they have any additional comments or opening remarks at this time.

[No response.]

Hearing none, I would simply say that I know that Senator Thurmond, the ranking member, and Senator Gorton and others who unfortunately had commitments that kept them from being here today have asked that their remarks be printed in the record and that the questions that they ask be submitted to the witnesses and that you reply as quickly as you can. I apologize for being late today. However, something is on the floor that I just could not get away from. But this is a very, very important meeting as far as the committee is concerned.

We will get right into it. So, Dr. Atkins, will you please proceed?

STATEMENT OF DR. MARVIN C. ATKINS, DEPUTY DIRECTOR, DEFENSE NUCLEAR AGENCY

Dr. ATKINS. Thank you very much, Mr. Chairman. It is a privilege for us to be here. Dr. Don Linger, Director of Testing at DNA, is sitting at the table with me and behind us are several of our colleagues, who run the principal line organizations within the Defense Nuclear Agency. I will call upon them if appropriate to help answer your questions.

I greatly appreciate the chance to inform the subcommittee about the underground nuclear testing for weapon effects purposes, which the Defense Department, through the Defense Nuclear Agency, executes. Let me say at this point, Mr. Chairman, that Vice Adm. Ted Parker, the Director of DNA, greatly regrets that he is not here today. I know that he discussed this with you last

week and explained that he had a long-standing commitment to be out of town.

Dr. Linger is going to discuss, with a set of pictures, what we do and how we do it in underground nuclear effects testing. I think to set the stage for that it would help if I talked for just a few minutes about the Defense Nuclear Agency itself, what the Agency does and how it does it.

We are primarily a research and development organization within the Defense Department. The Agency, after the current changes take place, will have about 1,420 people in it, over half of them located in the Washington area at two installations and almost all the rest out in Albuquerque and at the Nevada test site in the Las Vegas area.

Our budget, which is appropriated to the Defense Nuclear Agency, is \$404 million this fiscal year. In addition to that, we spend over \$200 million, which we are responsible for, which is appropriated to other entities within the Defense Department for work on their programs in areas in which we have special expertise. Over half of that \$200 million is part of the Strategic Defense Initiative, or SDI, which we execute for them.

We are proud of the achievements of DNA's research and development program. We concentrate on the effects of nuclear weapons, how to protect our own systems, our own people from the effects of the weapons of a potential enemy, how to make our systems harder—you will hear a lot from Don Linger about that. We also work on how to apply our own nuclear weapons more effectively.

The problems that DNA works on in the R&D field will become increasingly more important as arms control treaties in the future reduce the stockpiles of weapons on both sides. It will become even more important under a START environment than it has been in the past that America's systems be as survivable as we can possibly make them under a nuclear attack, and that those which do survive be most effectively executed and targeted.

We believe that this work is extremely important to deterrence. We believe that if a potential aggressor recognizes that we as a nation have done our homework, have made our military forces, and our civilian systems to the extent possible, survivable, and that our forces could indeed respond to a surprise attack or any other kind of attack, that that is a cornerstone of deterrence.

DNA's research and development program has many achievements under its belt and it is certainly not appropriate in this hearing—we do not have time this afternoon—to go into very many of them. Let me just list a few of the different kinds of things that we have worked on.

One example is the variety of things that are concerned with ICBM basing, with protection of America's ICBM forces, present and future, against any form of enemy attack. All of the basing plans which have been proposed for Advanced ICBMs, the MX missile, Midgetman, and so forth have stemmed from DNA's research and development programs. Everything that has been proposed in a serious way has come out of DNA research and development.

At the other end of the spectrum, we developed methods for allowing our warning satellites and our communications satellites to

propagate their radio signals through the plasmas at high altitudes that would result from a nuclear exchange.

We are helping the Strategic Defense Initiative as well as the program offices which develop warning and communications systems to make their satellite systems as invulnerable as they possibly can be. We work literally day by day with the Joint Strategic Target Planning staff at Omaha and with the Defense Intelligence Agency to assess the hardness, the potential survivability of Soviet deep underground systems, in which Dr. Linger is particularly a personal expert, their communications systems and so forth.

We are the Defense Department's focal point for the research and development program on the global effects of nuclear warfare. We have been executing half of the national research program on that problem since it was first started several years ago.

One last thing that I would mention just to demonstrate the variety of our activities in these fields is the Armed Forces Radiobiology Research Institute located here in the Washington area on the grounds of the Bethesda Naval Hospital. This is a part of the Defense Nuclear Agency, and their people are part of the people total which I gave you earlier. The Radiobiology Research Institute is the only laboratory in the Western world, the only laboratory in the world as far as we know, whose primary thrust is to determine the effects of high levels of radiation on human beings. They use a vast variety of research techniques and synthesize the data, of course there are no experiments on humans per se, but synthesize all the information we can to predict the effects of high levels of radiation on people. We are now moving rapidly into the phase of the work where we find methods of reducing and ameliorating these devastating effects.

The work of the Radiobiology Research Institute is, of course, of great interest to people who are working on radiation therapy for disease also.

An interesting fact about DNA is that in many ways we are a national laboratory. We are comparable in size, in budget, and numbers of people working on our programs, to the Department of Energy's National Laboratories. When I say comparable, perhaps two-thirds the size of the military programs of each one of the DOE laboratories. But we are different in that we do almost all of our work through private industry. The Radiobiology Research Institute, which I mentioned, is our only actual in-house R&D laboratory. The rest of our research and development program, or the great majority of the rest of it, is executed by private industry.

We have developed the management methods for creating the programs ourselves, we find the best people and research groups in the country to carry out the detailed research, who continually, day by day, week by week, feed back the results to us so that DNA people can integrate them into the body of defense knowledge.

DNA does some other very important things besides research and development which do not consume a lot of our budget, but are extremely important to the Defense Department and, I think, the national security. DNA people do the highest level of inspection of all of the military's nuclear units around the world. Each of the services has, of course, its own program for technical security, safety inspections and so forth, of their own units. DNA does the

Defense Department-level inspection. We have a group of about 35 people based in Albuquerque who spend most of their time traveling around the world to every ordnance company, every ship and so forth, that has nuclear weapons assigned to it, and inspects each one of these units on an average of every 4 to 5 years. So we do the highest level of inspection.

We also execute the management of the nuclear stockpile within the Defense Department. We have a group of people who keep track on literally an hour-by-hour basis of the whereabouts and the condition of every one of the nuclear weapons that is in the national stockpile. In every unit of the American military forces around the world, when a weapon is moved or when it changes its status, the unit sends an immediate message to our organization. That is entered into the real-time maintenance of the data base.

I could go on and on discussing what DNA does and how we do it. I think it is necessary for us to get into nuclear testing per se at this time. Congress has emphasized very strongly to the Defense Department its determination that military systems be thoroughly tested before they go into the field, and that we all understand, the extent to which science and engineering technology allow us, how weapons systems and all military hardware would perform under conditions of actual combat.

The Defense Nuclear Agency executes the service tests for nuclear survivability in the laboratory and in underground nuclear tests. One of the achievements of our R&D programs—and this work is still going on very vigorously—is to develop ever-better methods of simulating the effects of nuclear weapons in the laboratory without having to use underground nuclear tests. Because underground tests are expensive, they are few and far between. We always need better routine testing methods in the laboratory, and before laboratory testing we need better analysis methods in the computer.

We put a great deal of effort into those things, but for many systems, for many types of nuclear effects, the best proof test of their capability to operate in a service environment is an underground nuclear test. We also use—and Dr. Linger will explain this when I turn the floor over to him—underground tests to obtain engineering data necessary for effective application of the stockpile, and we use underground tests because there is simply no other way to obtain some of these types of data.

At this point, gentlemen, I would like to turn the floor over to Dr. Linger.

Senator EXON. Before we get to Dr. Linger, Dr. Atkins, we will, without objection, make your full statement a part of the record at this time. Thank you very much.

[The prepared statement of Dr. Atkins follows:]

STATEMENT OF
DR. MARVIN C. ATKINS
DEPUTY DIRECTOR
DEFENSE NUCLEAR AGENCY

Mr. Chairman and Members of the Committee:

For over four decades, the foundation of national defense strategy has been deterrence of conflict based on forces that are survivable under attack and effective in retaliation. This means that our forces must be able to withstand a determined attack, that our command and control structure must be able to direct an appropriate response, and that the forces, when necessary, inflict an unacceptable level of damage on the attacker.

THE MISSION OF DNA

The fundamental mission of DNA is to provide the means to ensure the required survivability and effectiveness of the nation's deterrent forces. The flexible response strategy makes nuclear survivability a requirement for forces of all kinds: nuclear, non-nuclear, strategic and non-strategic. The Agency develops and provides the information, technology and design tools necessary for acquisition of Department of Defense (DoD) systems with enhanced survivability, security, safety, and effectiveness. These are the ingredients of deterrence itself. To do this, DNA plans and conducts programs to resolve nuclear weapon effects issues, to develop techniques to harden DoD systems to these effects and validate that hardness by tests, and to formulate technical and conceptual bases for new systems that will assure continued deterrence.

Let me address the DNA mission in the context of the evolution now occurring in nuclear forces and programs. Under the Intermediate Nuclear Forces Treaty, some of our nuclear missiles are being withdrawn from the inventory for destruction, as are the corresponding Soviet missiles. We have thus committed to maintain deterrence with fewer forces, so that the survivability of remaining forces must take on an increased value in the equations of deterrence. Further, each remaining weapon must be capable of effective application against a target structure that is becoming harder on one hand and more mobile on the other. DNA's mission is critical to these considerations, and would become even more so under a START agreement to reduce strategic forces.

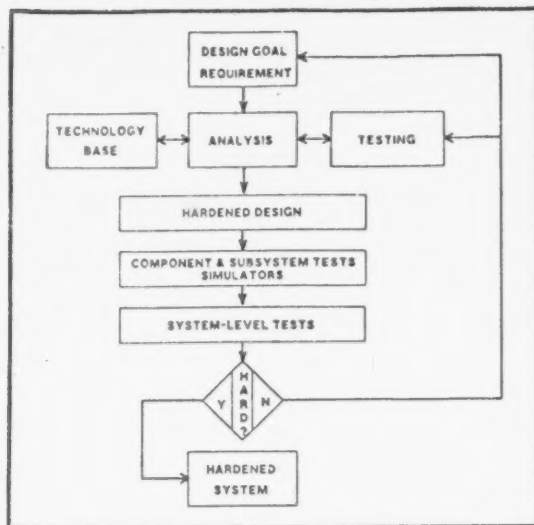
With this brief overview of the DNA mission, let me now return to the survivability and effectiveness of our deterrent forces and their relationship to DNA's test programs.

SYSTEM SURVIVABILITY, HARDENING, AND TESTING

Nuclear Effects Technology Base. The foundation of our technical programs supporting survivable and effective systems is the nuclear weapons effects technology base. This technology base consists of the knowledge we have accumulated over the last four decades about nuclear weapons environments; the physics of the interaction of these environments with materials and systems; hardening techniques; and nuclear effects test capabilities. Today, we have a substantial collection of data that is suitable for many system survivability and effectiveness considerations. As budgets permit, we have established aggressive research programs to assure that the technology base contains the information needed by system developers and operational planners when they take advantage of new technologies.

Survivability. System survivability against nuclear attack is achieved in US systems through a cost-effective application of several techniques, among which are hardening, concealment/deception, reconstitution, mobility, and proliferation. In today's nuclear and conventional systems with critical missions, nuclear hardening is almost always a key element of survivability. The nuclear hardening requirements are determined to a large degree by the operational environment in which the system will operate. For example, the requirements for a Trident reentry body will be more stringent than for a communications satellite in geosynchronous orbit. Nuclear hardening and other contributors to survivability are traded-off with cost, performance, and other parameters early in concept development. The results of these trades comprise the entry point to the process of developing hardened systems.

The System Hardening Process. The flow diagram below is a stylized depiction of the process of developing hardened systems.



Development of hardened systems.

The first block of the chart illustrates that the initial step in the hardening process is the trade-offs that establish the design requirement. Analysis, depicted in the second set of boxes, plays a crucial role throughout the hardening process. It relies on the analytical models, environment descriptions, and hardening techniques embodied in the technology base. These analyses are essential for establishing hardened designs and test

plans. Testing at an increasing level of system integration is required to avoid the existence of unknown and unpredictable flaws in the hardened system. DNA has developed a suite of simulators using non-nuclear energy sources to exercise components, subsystems and some systems in radiation, thermal, electromagnetic pulse (EMP), and blast and shock environments. However, our simulators can not provide the time phased combined environments of a nuclear detonation, and can not currently provide the test volumes and radiation dose rates needed for many system-level radiation tests. These capabilities can only be supplied by underground nuclear effects tests. System-level tests are the most reliable method for validating system hardness. Indeed, there are numerous examples of systems that successfully passed all component and subsystem tests only to fail when tested as a full system.

Let me emphasize that developing hardened systems, while appearing to be a rather methodical and straightforward process in the diagram, requires constant attention to detail and the seasoned judgment of designers with years of experience in nuclear weapons effects and their application to system hardening.

US UNDERGROUND NUCLEAR TESTING

The Department of Energy (DOE) and the DoD are responsible for the conduct of all US underground nuclear tests (UGTs). Both

departments conduct tests, but for different purposes, data, and implications. The DOE tests are not addressed in this statement.

Why DoD Tests. There are three primary purposes for DoD UGTs, all centered on nuclear weapons effects on military systems: (1) evaluate system hardening to confirm that it has been achieved; (2) provide weapon effectiveness data to improve US target planning; and (3) provide data to validate that engineering analyses provide realistic representations of nuclear effects.

Test Configurations. DoD tests use a nuclear device located in a large excavated room as a source of radiation or as a means of generating an intense ground shock or airblast in a large cavity. The radiation exposure tests have used large horizontal steel "line-of-sight" pipes as much as 2000 feet in length which are evacuated of air to simulate exoatmospheric conditions. Cylindrical exposure volumes as large as twenty-seven feet in diameter provide chambers for the test items, e.g., strategic missiles and reentry vehicles. A second common type of DoD test is conducted in an underground cavity -- a very large chamber excavated at the end of a tunnel. Hemispherical chambers as large as 36 feet in radius have been used to evaluate the coupling of nuclear energy into the ground to produce ground shock. This data is needed to evaluate the effectiveness of current and future weapons against deeply buried hard targets. As can be inferred from the above, DoD tests are large, very complex, require years of planning and preparation, and involve at their peak activity hundreds of engineers, scientists, and technicians. The time required to field a previously planned DoD test ranges from one to two years.

DoD Survivability Tests. The configuration for DoD survivability tests, the horizontal line-of-sight arrangement described above, provides a realistic x-ray environment not achievable by other means, protection of the test items from extraneous debris, and containment of explosion products. It also provides excellent opportunities to acquire data from sensors that measure the response of the test item during radiation exposure, to recover the test items for inspection and analysis of damage, and to diagnose the test environments.

Over the last two decades, the primary users of DNA survivability tests have been the developers of strategic missile systems, including Minuteman II and III, Polaris, Poseidon, The Spartan ABM, Trident I, Peacekeeper, Small ICBM and Trident II. Thousands of smaller experiments have been included in these tests as well, satisfying the technology needs of the Agencies,

laboratories and the Services.

Weapon Effectiveness Tests. Modern deep underground hardened structures are strategically important but difficult to hold at risk with current nuclear weapons. The key issues in an effective attack of these structures are the amount of bomb energy coupled to the ground in the crater region and the ensuring propagation of a strong ground shock. The coupling of bomb radiation to the ground depends on very complex physical processes that have been modeled but never validated for lack of data. DNA recently conducted a test employing a modern nuclear device in an underground cavity with a radius of 36 feet. Measurements of the radiative bomb output and the associated ground shock coupling have provided baseline data that will permit assessments of candidate weapons systems for attacking this class of targets.

Model Validation Tests. Historically, US estimates of crater dimensions were based on cratering data from the large yield Pacific Proving Grounds (PPG) atmospheric nuclear tests. Interest in superhard silos in the early 1980s, and newly developed computer calculations predicting much smaller craters for US geologies, led to a reassessment of crater dimensions. One key issue was to explain the mechanism causing the large PPG craters. A second was the validity of the cratering calculations. A two-pronged approach was used, consisting of a more stringent characterization of the PPG geology and two cavity UGTs to provide cratering data relevant to US geologies. Results of the UGTs confirmed the computer predictions while the new PPG data showed that the large Pacific craters were late-time phenomena related to the porosity and fragility of the coral geology. This provided a scientifically sound cratering predictive methodology with results that have been incorporated into hardened structure design manuals.

FUTURE UNDERGROUND TESTS

As long as deterrence based on survivable and effective forces continues as the mainstay of national defense strategy, underground nuclear tests must be preserved as the vital national asset they currently represent. DoD requirements for future underground tests are emerging that call for yields near the current threshold of 150 Kt, and for new test configurations. These include: (1) larger cavity tests to evaluate the ground shock coupling of realistic strategic weapons; (2) larger test beds with yields high enough to accommodate validation tests of large space systems; (3) new test configurations for "source-region" electromagnetic pulse tests; (4) new test beds for less

expensive, lower yield tests of strategic missiles; and (5) reusable test configurations. To the degree allowed by budget constraints, these emerging requirements will be prioritized and addressed in the future DoD/DNA test program.

SUMMARY

Underground nuclear tests are required to provide vital support to the national defense policy of deterring aggression through the existence of survivable and effective forces. Test configurations have been tailored for nuclear weapon design, validation of system hardness, improving the effectiveness of US weapons, and validating analytical models of nuclear effects. The current high confidence in the survivability of US strategic missile systems would not be possible without underground nuclear tests. Requirements are now emerging for a new class of underground nuclear tests to support future system requirements and to improve the effectiveness of US weapon employment planning.

Senator EXON. I would like also to recognize my friend and colleague from South Carolina, the ranking member of the subcommittee, Senator Thurmond, for any opening statement, and then we will go into questions after we have heard from Dr. Linger.

Do you have any opening statement?

Senator THURMOND. Mr. Chairman, I believe I will put my opening statement in the record. Thank you very much.

[The prepared statement of Senator Thurmond follows:]

PREPARED STATEMENT OF SENATOR STROM THURMOND

Thank you Mr. Chairman. I congratulate you for holding this hearing this afternoon and I join you in welcoming Dr. Atkins and Dr. Linger. The budget for the Defense Nuclear Agency has always been under the purview of this subcommittee. The importance of the agency's work will be manifested this afternoon in the number of critical programs that are directly supported by the Defense Nuclear Agency's efforts.

Mr. Chairman, you and I have worked very hard over the last several years to ensure that our nuclear deterrent strategy is supported by the necessary nuclear testing. As you know, a majority of Members in the House of Representatives do not share our view. Most of the argumentation for nuclear testing has been related to the Department of Energy's requirements to develop and maintain the nuclear stockpile.

Today, we will be hearing about the necessity of nuclear testing for equally important purposes. The first of these is the critical necessity to determine the effects of nuclear weapons on the survivability of our deterrent forces and space systems. The second is the necessity of nuclear testing to determine the weapons effects of our deterrent forces against the increasingly hardened target complex in the Soviet Union.

Mr. Chairman, I look forward to receiving the testimony of our distinguished panel, and will have some questions for our witnesses at the appropriate time. Thank you, Mr. Chairman.

Senator EXON. Thank you very much. Before we go on, let me ask one question that I think was maybe on the minds of other members of the committee.

START NEGOTIATIONS

Dr. Atkins, from what you know now how will START likely affect hardening or no hardening and also what, if any, changes that might have to be made or should be made in the Nuclear Test Ban Treaty as a result?

Dr. ATKINS. Sir, I stay fairly close to the START negotiations. I certainly do not have the definitive word on them, but they impact our work very closely, and the information that we have has been able to help the START delegation on many occasions.

There has been no discussion whatever, to my knowledge, of any limitations on hardening, and hardening is, I think, one of the most attractive advantages of much of the work that we do. For example, there is no limitation, no political limitation, on how hard either side is allowed to build a silo. We believe it is possible to build missile silos now that could survive at least up to [deleted] which is perhaps [deleted] times what people thought a decade ago was possible.

That could be a tremendous help in increasing the survivability of our ICBM forces in the future. There is no limitation on that, as there tends to be on active defenses, for example. We like to talk about passive defense.

Senator EXON. Let me interrupt you right there. It is true that today we suspect that they have harder facilities than we do?

Dr. ATKINS. Yes, sir.

Senator EXON. And specifically, as far as you know, that has not been seriously addressed in the START negotiations?

Dr. ATKINS. That is correct, Mr Chairman. It has not been seriously addressed, to the best of my knowledge, and I really do not see how it could be very well. It would require verification, and an extremely intrusive on-site inspection involving detailed measurements of the properties of the concrete, and the other fellow's hardware, and so forth. I think that would be extremely difficult to arrange.

TEST BAN TREATY

Senator EXON. How about the Test Ban Treaty? Has there been any talk in those negotiations with regard to changes in the Test Ban Treaty such as how much each side could test? Is there any change in that? Or is that presumed to remain the same as it is?

Dr. ATKINS. There has been no negotiation with the Soviets or detailed discussions for 2 or 3 months now.

Senator EXON. I am talking about earlier.

Dr. ATKINS. The U.S. position, of course, is that we should work out a verification plan for the 150kt Threshold Test Ban Treaty which is acceptable to both parties and then proceed from there.

Senator EXON. We are arguing or discussing at least how we do that. What is your best estimate at this time, if you know, as to whether or not you believe that there would be a reasonable chance of working out something along that line, possibly as a part of this treaty?

Dr. ATKINS. For verification?

Senator EXON. Yes.

Dr. ATKINS. For verification I think there is a good chance something could be worked out this year. I know the two sides seem to be understanding each other better all the time.

In the exchange program carried out during 1988, we visited their test sites, installed the CORTEX monitoring equipment on one of their shots, and got acquainted with their operations. Then the Soviets reciprocated by visiting the Nevada Test Site and monitoring one of our tests. Those activities helped a great deal to allow the negotiators to understand what the other side is talking about.

Senator EXON. So by and large what you are saying is that you do not see how we could ever come to an arrangement with the Soviets on hardening, but you do think there is a possibility that we could get on with some understanding on the verification associated with nuclear testing?

Dr. ATKINS. I believe that we can work out a verification protocol with the Soviets which will allow each side to do what it feels it needs to do within the constraints of the Threshold Test Ban Treaty.

Senator EXON. Thank you. Go ahead.

Dr. ATKINS. Mr. Chairman, if I might add one more thought on hardening, I believe very strongly that it is in the interest of world peace and stability for each side to have confidence in the surviv-

ability of its forces. I do not think that we should accept any limitation on how resilient we can make our own forces to attack, and for the sake of world peace I am not sure that we would want the Soviets to have a limitation either.

The more confident both sides are of their survivability under a surprise attack, the less incentive anybody has to move first.

Senator EXON. Well, that is true. I think the other side of that is that the more secure your forces are, the more warheads the other side will build to make sure they are not? I mean, that is the other side of that puzzle, isn't it?

Dr. ATKINS. Personally I think the best combination is survivable forces and an orderly reduction in numbers, but a reduction in numbers not so low that each side would lose confidence in its retaliatory capability. We would like for neither side to have confidence in first strike capability but to have confidence in its retaliatory capability. That is the arrangement that will continue world stability.

Senator EXON. Thank you. Dr. Linger, would you proceed, please.

**STATEMENT OF DR. DON A. LINGER, DIRECTOR OF THE TEST
DIRECTORATE, DEFENSE NUCLEAR AGENCY**

Dr. LINGER. Mr. Chairman, my name is Don Linger. I am Director of the Testing Program at the Defense Nuclear Agency and I am going to talk to you about the whys and wherefores of underground nuclear testing.

I am going to present to you why we do the tests, what comes out of those tests, and how that fits into our deterrent posture and what the outlook is. I will present to you evidence, strong evidence, of the importance of the underground nuclear test program in providing the necessary confidence in our deterrent forces and our command and control systems.

I would like to present the future of our program and tell you why the program is continuing and what the program is addressing as it continues. I will also summarize how well the program is meeting the requirements.

THE DOE ROLE; THE DNA ROLE

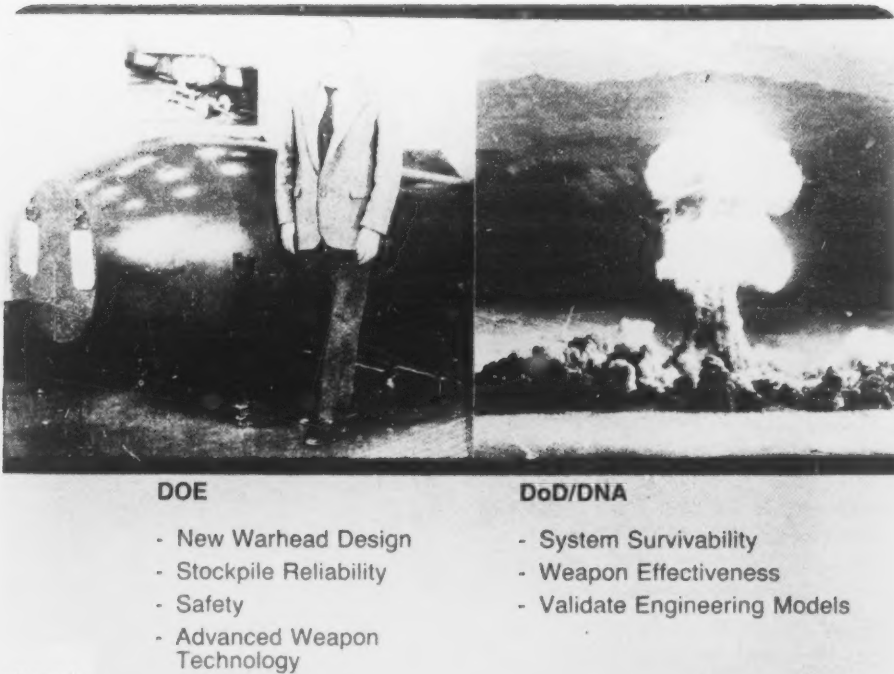


Figure 1

First let me present the differences between what the Defense Nuclear Agency does and what the Department of Energy does. The Department of Energy conducts tests to evaluate warhead design, reliability, and safety for advanced weapon technology. The Defense Nuclear Agency takes it from the point of system survivability. Weapons systems must operate in a nuclear environment. DNA evaluates the effectiveness of the weapons systems and develops survivability technology.

The DNA mission then is what we are going to talk about from here on out, and not the Department of Energy's mission and what they do. So let me then briefly discuss nuclear weapons effects and the reason we conduct these tests.

Nuclear Effects

Surface & Near Surface

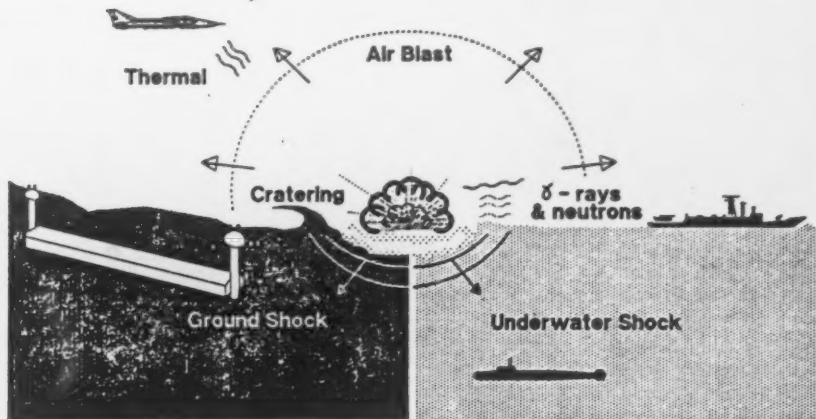


Figure 2

A surface or near-surface detonation produces ground shock, cratering, water shock, and a lot of source region and close-in effects that are important to tactical systems.

EXOATMOSPHERIC DETONATIONS



Figure 3

Exoatmospheric detonation of a nuclear device such as the Soviet ABM system produces an enormous amount of radiation. As long as you are within the line of sight of detonation you will see the gamma rays, x-rays and neutrons. To build a system which survives in that environment is absolutely imperative for our confidence in deterrence.

WHY DOD TESTS FOR SYSTEM SURVIVABILITY

Why DoD Tests System Survivability

Assess Nuclear Hardness of

- Strategic Systems
- Command and Control Systems
- Technology Development

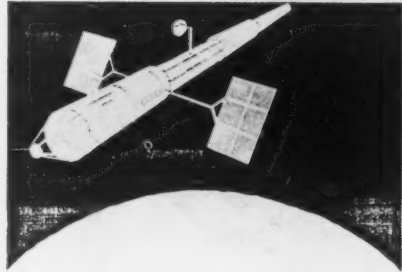


Figure 4

So the three things that we do these tests for are system survivability of detection, tracking and warning systems; command and control systems; and strategic missile systems.

WHY DOD TESTS FOR WEAPONS EFFECTIVENESS

Why DoD Tests Weapons Effectiveness

- Optimize Use of Strategic Systems
- Assess Soviet Vulnerabilities
- Aid Targeting
- Understand Effects of Modern Weapons

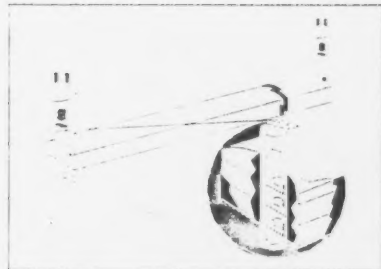


Figure 5

Weapon effectiveness, for instance, is characterized in this picture of the Soviet underground facility. Discovery changed the target set, requiring evaluation of such target vulnerabilities and evaluations of the way in which a nuclear device will affect those targets.

WHY DOD TESTS FOR MODEL VALIDATION

Why DoD Tests Effects Model Validation

- Crater Dimensions and Related Variables
- Source Region EMP
- Advanced Electronics

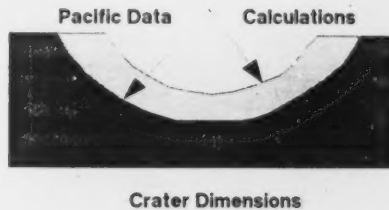


Figure 6

Lastly, for model validation, DNA develops the survivability models and survival technology for predicting how systems will survive and what the effectiveness is.

TEST CONFIGURATIONS

HISTORICAL TEST CONFIGURATIONS

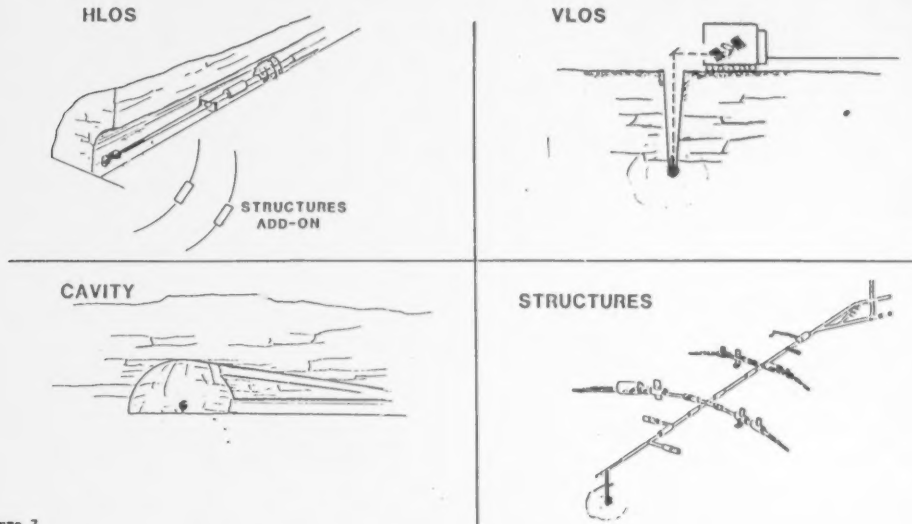


Figure 7

We conduct several principal kinds of tests. There is the horizontal line-of-sight test, the vertical line-of-sight test, the cavity test and the structures test, and I will discuss each of these and show you pictures of them and what each type test amounts to. In every case, we are detonating a nuclear device buried deep underground at the Nevada Test Site using the radiation to illuminate experiments and to produce atmospheric type of effects underground, and to evaluate hardened underground facilities in the last one.

HLOS Test Configuration

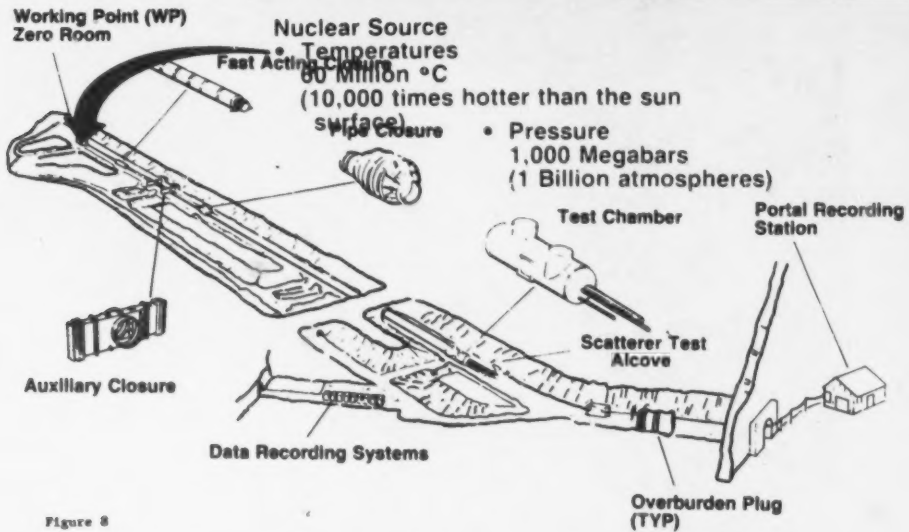


Figure 8

The first type of test, the horizontal line-of-sight test, is a test in which when the device is detonated the radiation streams down a pipe deep underground, going through a number of closures which keeps the nuclear debris from coming down that pipe, which then irradiates a number of experiments in the test chamber. That is not an easy job.

The temperature is 10,000 times hotter than the sun in the zero room and the pressure produced is a billion atmospheres when that device goes off.

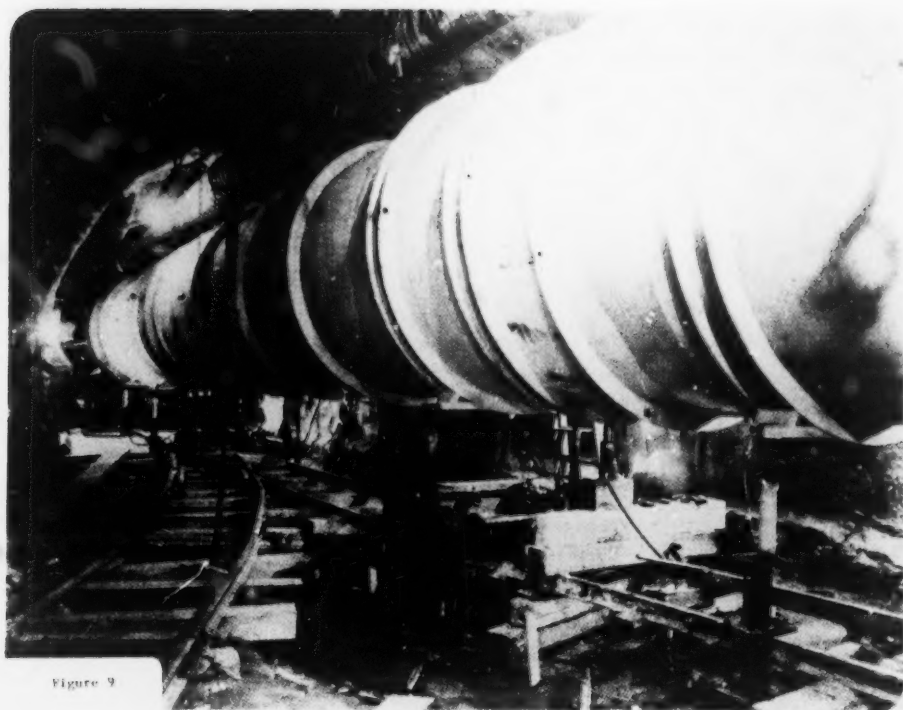


Figure 9

We direct the radiation down an evacuated line-of-sight pipe. You are looking at a line-of-sight pipe being installed in an underground tunnel complex. The device will be located 800 feet down. You are standing next to where the experimental chamber will be located.

EXPERIMENTS

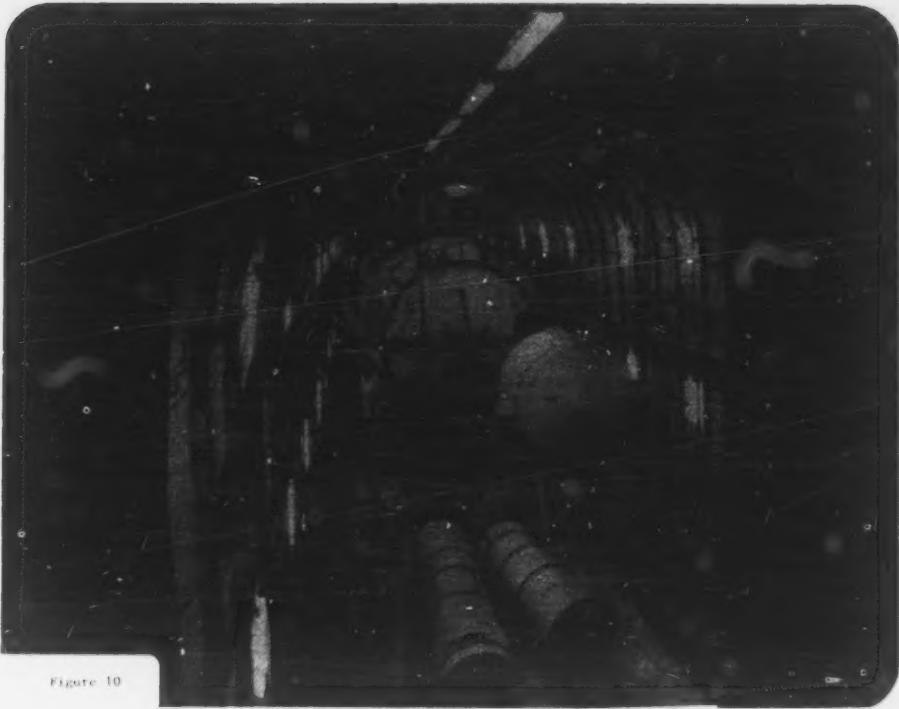


Figure 10

You are looking at one of the large experimental chambers fielded in an early test on the Spartan missile. The Spartan missiles were placed inside this 3-story-high evacuated chamber. This underground cavern is about as big as a Metro station. You are 2,000 feet away from where the device will be placed. The radiation comes down that pipe and illuminates or irradiates everything in that chamber.

Dr. ATKINS. Don, you could point to the men there.

Dr. LINGER. Yes. To give you a good idea of the scale, there are some men standing there next to that large experimental section.

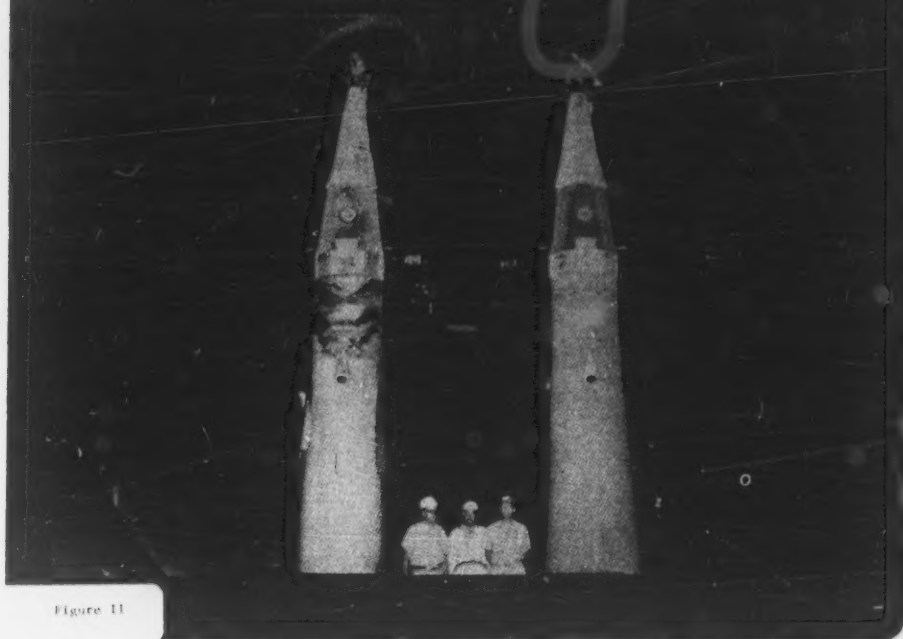


Figure 11

Dr. LINGER. Here is what it looks like when we had the Spartan missiles inside the experiment chamber. Here are some men standing with the entire last stage of the Spartan missile. This is post-test, and you will notice the instrumentation cables and the discoloration from the test—a successful test.

[Figure 12 deleted.]

This is a bomb's-eye view. This is what the device sees as it looks down this line-of-sight pipe and sees all of the experiments that are going to be subjected to the radiation.

This is the Mark V, the Mark XII reentry vehicles. Mark XXI, I am sorry. That is the end view of that one and the end view of this one, and all of the other elements in there are portions of the electrical and guidance systems of the missiles. They were all subjected to a test. That test was conducted in 1985.

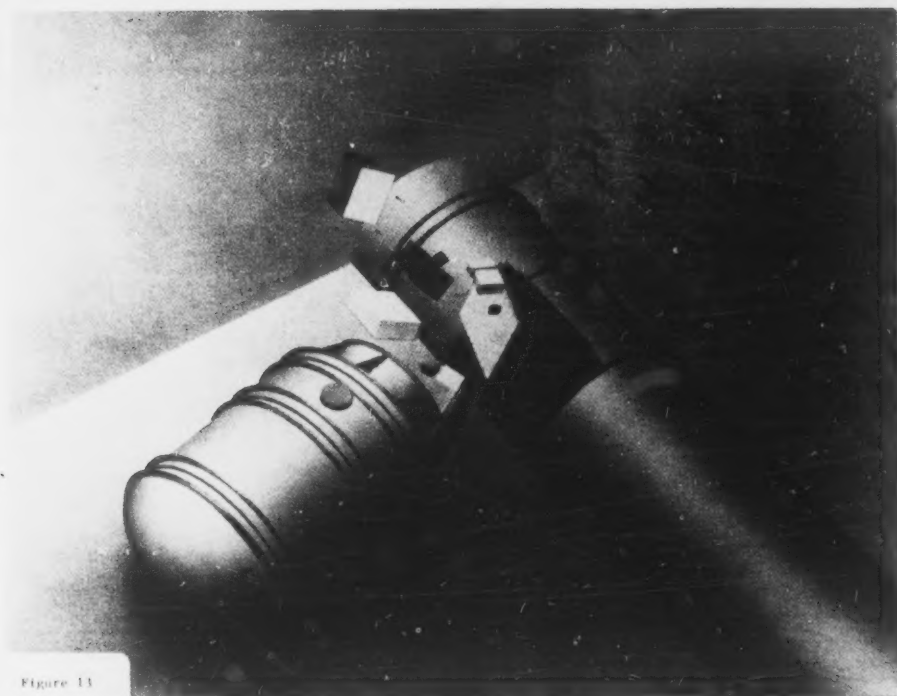


Figure 13

When we put together the system and incorporate it all into a configuration which tests the entire system, we often put that system in a large container. The radiation comes down that pipe and is reflected into that chamber through what they call a scatter plate.

[Figure 14 deleted.]

This is a picture of a man to give you an idea of the scale of the Trident II post-boost vehicle. You are looking at the back side of the Trident II post-boost vehicle. On the other side are all the RVs locations.

What you are looking at is all of the electronics and guidance instrumentation for that vehicle. That system, when the test is conducted, sees exactly the same environment that it would see from the ABM, and it is designed accordingly.

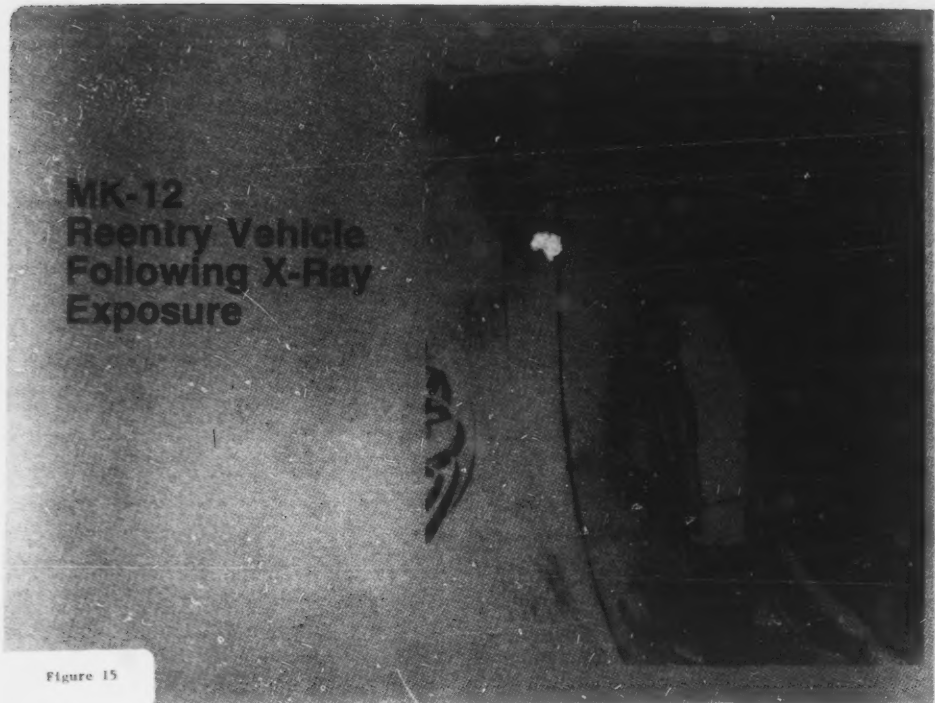


Figure 15

Sometimes when we conduct these tests there are surprises. This is the Mark 12 reentry vehicle, which is the first Minuteman III reentry vehicle. The damage you see is an explosion of the casing of the RV which resulted from radiation only. The radiation hit that with such a fierce amount of energy that it did in fact cause an explosion, a thermomechanical explosion, of that RV.

Obviously, the reentry vehicle would not have survived.

[Figure 16 deleted.]

The follow-on Minuteman III reentry system contained an antenna window for the radar-fusing. [Deleted.]

RESULTS FROM UNDERGROUND NUCLEAR EFFECTS TESTS

Missile System Results from Underground Nuclear Effects Tests

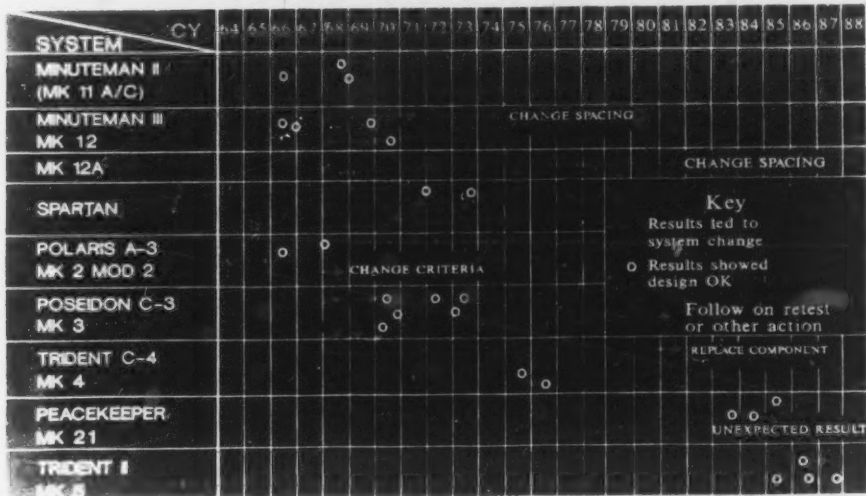


Figure 17

On line two is the Minuteman 12-A when it was initially fielded. Test results caused a [deleted] as it did with the Mark 12 for the Polaris A3 [deleted].

Of all these missile systems, you will find only one system that was fielded that did not require major modification after the full system was tested. All of the rest of them, as indicated with those square dots, required major modifications and redesign to make them survivable and to give us the necessary confidence in them as a deterrent.

VLOS-TYPE TESTS

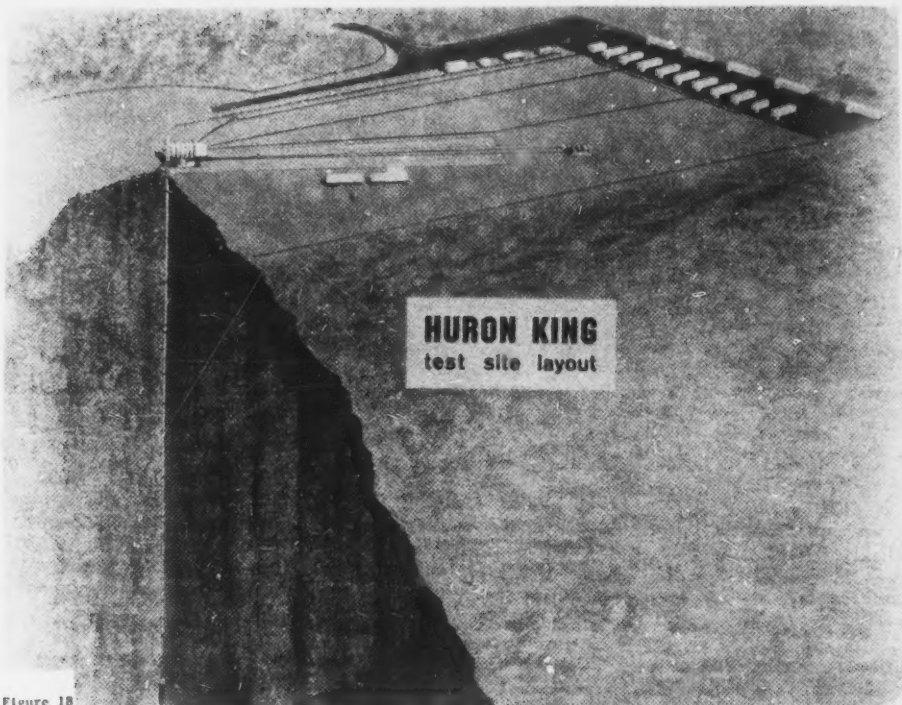


Figure 18

A second kind of test that I want to talk to you about is a vertical line-of-sight. This is a test in which we locate the device about 1,000 feet below the surface and test a single large system.

The others, as you saw from the experimental section, contained many experiments. In this type there is one, and I will show you that.

When the device goes off, the radiation goes up this pipe and goes into that large chamber at the surface. No debris goes up that pipe, only radiation.

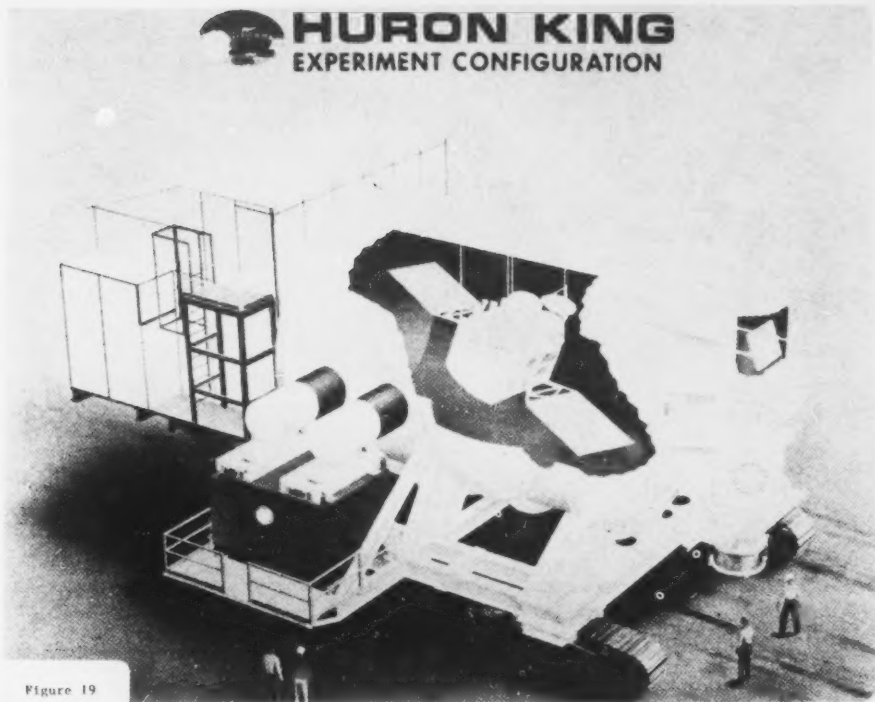


Figure 19

The radiation is deflected into that large evacuated chamber, as on this particular test called HURON KING. It was conducted in 1980, irradiated or illuminated a mock-up of a DSCS, which is a communications satellite. It was not the full-scale satellite. It was not an active, real satellite. It was a mock-up of it. It was used to develop the hardening technology of all satellites.

Because of the cost of testing a satellite, we have yet to test a full satellite, but that is the kind of tests that we conduct with a vertical line-of-sight test which is unique to DNA.

CAVITY TESTS

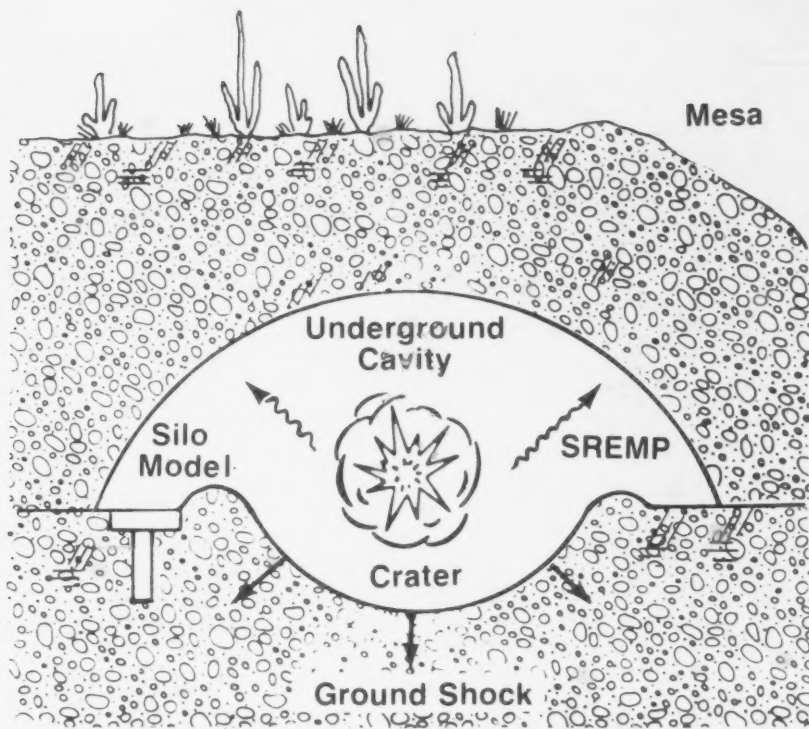


Figure 20

Lastly, DNA conducts some interesting types of tests in a cavity to try to obtain the surface and near-surface atmospheric effects in an underground test. It is for ground shock, cratering and close-in electrical source region EMP.



Figure 21

We have recently, in December of last year, conducted one of these tests. This is the construction of that test. It is a 72-foot diameter cavity. The excavation going on here was to excavate below the plane where it would be back-filled, the instrumentation will measure the cratering and ground shock. This 72-foot cavity is, incidentally, about the same size as your Capitol dome.



Figure 22

When that test was conducted, the result was the development of a crater where the nuclear device was located. The reason for undertaking these tests was to try to validate the cratering technology that was emerging from our code development.

CRATERING TECHNOLOGY

Crater Dimensions

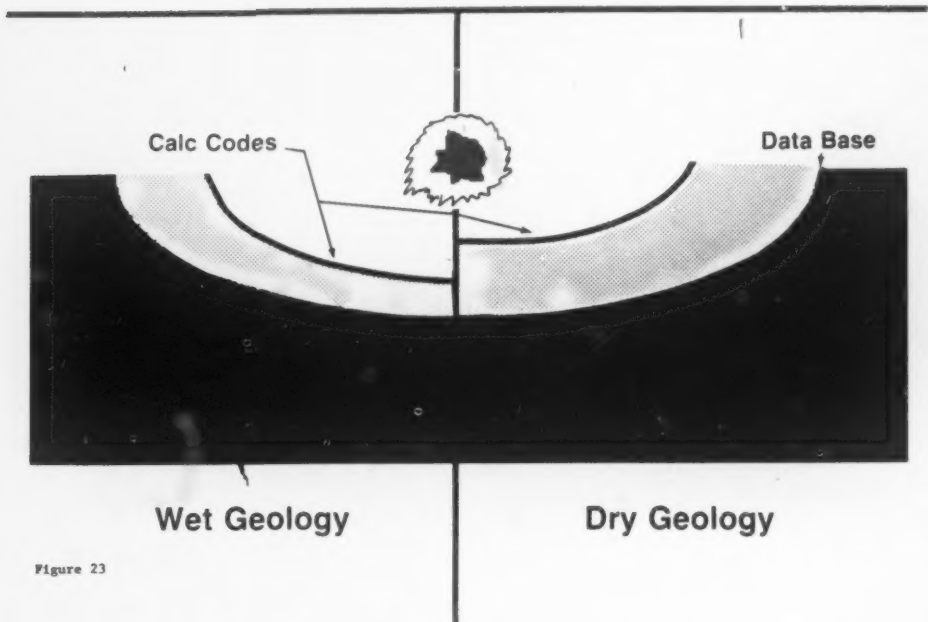


Figure 23

That cratering technology had identified that the predicted craters [deleted] on the basis of the Pacific Proving Ground data base, which was from the old atmospheric tests conducted out in the Coral Atolls.

When we conducted those tests in the 1960s, late 1950s and early 1960s, we had found large craters resulting, and our cratering prediction technology predicted large craters. The code developers, however, disagreed with that and found that it depended enormously on whether the soil was wet or dry. In the fielding and the hardening analysis for the Minuteman missiles, and for the basing for the MX or the super-hard silo, it was imperative that we sort this out.

We sorted it out and determined, the optimum siting for super-hard silos for the Air Force, if they were to field their MX missiles in such a system.

[Figure 24 deleted.]

Analysis also pointed out a very interesting thing. It showed a weapon's effectiveness against a Soviet POL underground storage system. The underground storage tank was susceptible and vulnerable only to the crater size, so its kill capability was dependent upon the predicted crater that these weapons would produce.

The old criteria from the Pacific Proving Ground and the Coral Atolls had indicated [deleted] and what we found after we sorted out the new data from the codes and had conducted those tests, was that we had [deleted]—an interesting outcome of underground testing which indicates the need for doing those kinds of tests for evaluating effectiveness of a system.

Underground Structures Test

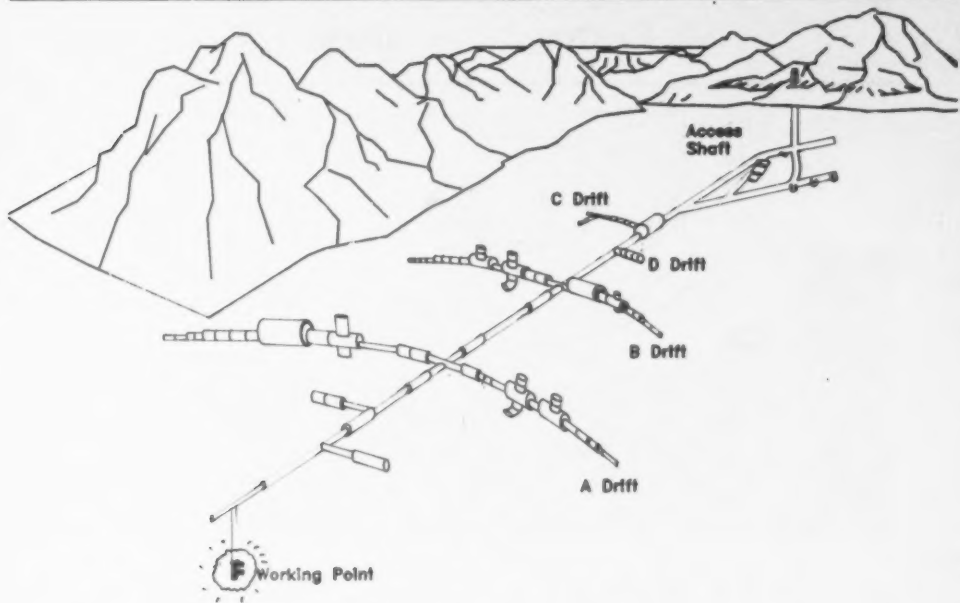


Figure 25

We have also conducted underground tests on underground hardened systems. These underground hardened systems are elements of underground facilities which were tested in support of the construction of the NORAD hardened underground facility.



Figure 26

The results of that type test and others we have conducted on underground facilities is exemplified by this, in which you note the deformation. The device was located on the right side. The ground shock produced the deformation shown on the right. This shows about a 10-percent closure. That is considered to be moderate damage for this underground facility. That is the ventilation line running down through the tunnel opening.

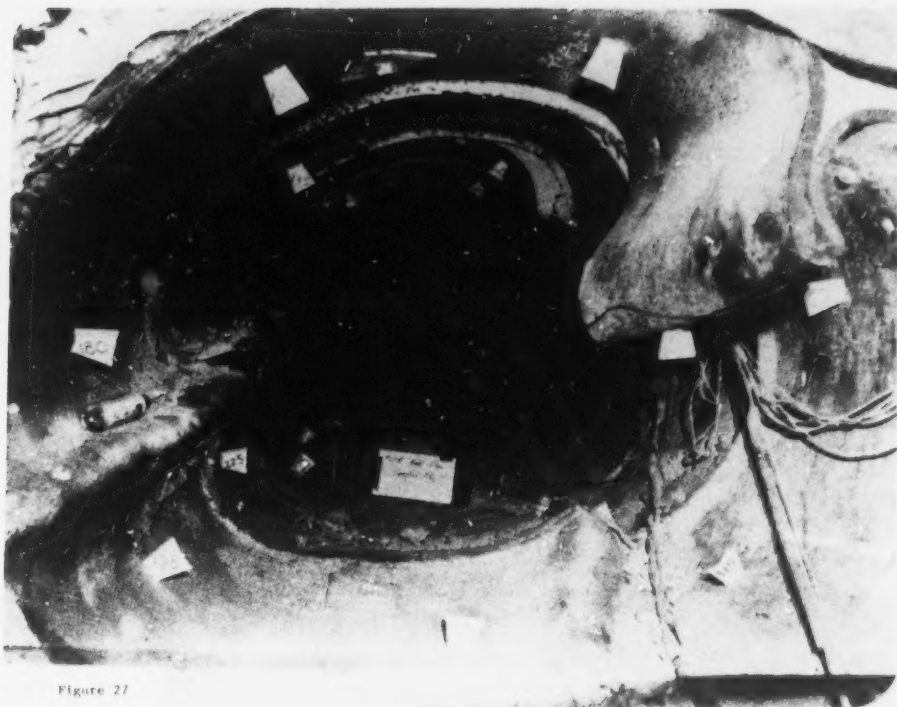


Figure 27

Heavier damage at the same range was found in a different kind of design. This is the result of an underground test in which we were sorting out the way in which the liner design affected the survivability of the system.

SOVIET UNDERGROUND FACILITIES

[Figure 28 deleted.]

The bottom line for all of these tests was that the U.S. criteria for hardening could be used to characterize the hardness of the Soviet underground facilities. Our data base gave us the kind of hardness criteria for the Soviet underground facilities shown here.



Figure 29

[Deleted.]

[Figure 30 deleted.]

[Deleted.]

[Figure 31 deleted.]

[Deleted.]

This is probably the Soviets' answer to SDI. It will provide their upper management leadership and military survivability in a nuclear environment.

Ground Shock Coupling

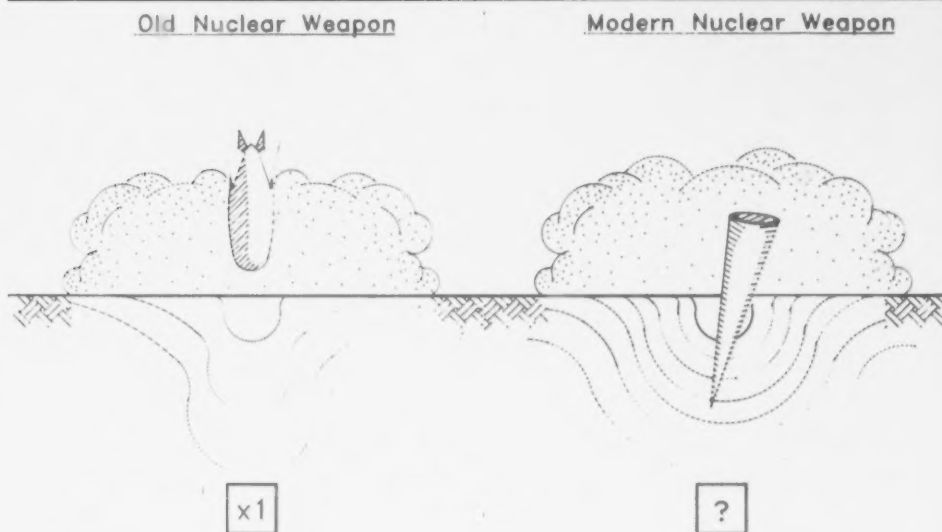


Figure 32

To hold that at risk, we now have to sort out the difference between the way a bomb of the type that we have done atmospheric tests with couples into the ground and produces ground shock vis-a-vis a modern, highly radiative type thermonuclear device and the way it interacts with the ground, and especially how it might interact with the ground if it was in the penetrating mode.

[Figure 33 deleted.]

Let me summarize briefly. In the 1940s, the bombs were 20 times heavier and 20 times smaller in yield than the current devices, and they are changing every day. The targets were far less hard than the current targets. The current target sets are [deleted] harder than the old targets.

So we are in fact in a very moving, dynamic condition of changing from the type of device used in the old days when we conducted all the atmospheric tests to evaluation of these new, modern, highly radiative devices that are currently in our stockpile and inventory. We are trying to evaluate the differences in the targets from those old soft targets to the new hard targets.

These are some other considerations that may be even more important.

[Figure 34 deleted.]

[Deleted.]

[Figure 35 deleted.]

[Deleted.]

My personal estimate of the amount of money they have invested in these tests is over \$1 billion.

Evolving Requirements

Higher Yields

- Survivability Tests of Larger Objects
- Ground Shock Coupling of Strategic Weapons

New Configurations

- Source Region EMP
- Nuclear Shock Tube
- Low Yield Testbed
- Reusable Test Configuration

Figure 36

These are our requirements as we see them in underground nuclear testing. Number one, the testing of full-size, ready-to-roll systems is an absolute must.

Second, we have got to sort out the effectiveness of our new, modern strategic weapons. That is absolutely imperative. We have on our books a number of ways, new things that we are going to do in response to those requirements. One of them is the source region EMP for tactical systems, which is a nuclear shock tube type of test in which we would look at the fireball effects on close-in, superhardened systems, and low-yield and reusable test beds to try to more economically conduct these kinds of tests.

UGET REQUIREMENTS

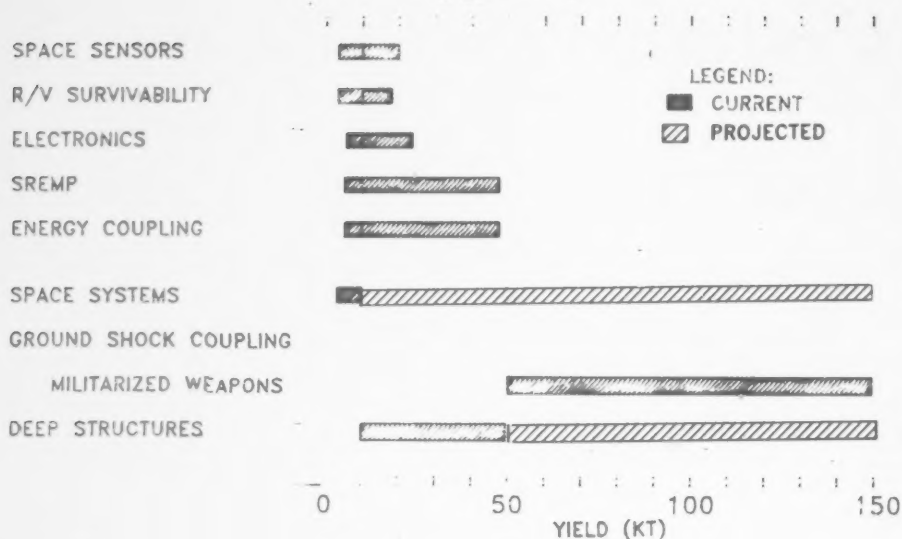


Figure 37

The yield requirements shown on this chart address the chairman's question about the yield and the yield problem, if in fact there is a limit on the size of the nuclear device which can be used in these tests. We have conducted approximately 60 of these tests since the atmospheric test ban treaty. We have tested with a source that is approximately and slightly smaller than [deleted] about 50kt, with some of our tests going as high as or approaching the 150kt yield.

We see the requirements [deleted] in which we have a source [deleted] out to 150kt.

UNDERGROUND NUCLEAR TEST SCHEDULE

[Figure 38 deleted.]

This is a schedule of the underground tests that the Defense Nuclear Agency currently has on its books. These are the horizontal line-of-sight tests that I described to you. There is one scheduled approximately every 18 months. Those tests meet approximately 80 to 85 percent of the requirements identified by the services and the DOD components. (Recent budget actions have reduced the test schedule so that the current HLOS schedule only satisfies from 60 percent to 70 percent of the requirements.)

Of the cavity test that I have described to you, we have one on our books for [deleted]. That is probably addressing about half of the requirements we actually have.

Of the electrical source region test, we have two on our books, one for [deleted] and one for [deleted], and those probably are meeting about half or 50 percent of the requirements that have been identified.

If we are to meet anywhere close to 90 percent of the requirements that we have for both sorting out the effectiveness of strategic weapons and developing hardness criteria for the hardening of our own systems, this is the kind of test program we need.

SUMMARY

SUMMARY

- Underground Nuclear Tests Are Vital To Deterrence
 - System Survivability
 - Weapon Effectiveness
- Confidence In Deterrent Forces and C³ Based on Underground Radiation Effects Tests
- Future UGET Program Must Address Emerging Requirements
 - Coupling, Ground Shock, and Effectiveness
 - Space Systems Survivability
 - Unique Radiation Effects
- Program Resources Stressed

Figure 39

The summary that I talked about at the very beginning—let me end up with that now. I have shown you evidence that it is imperative to conduct full-size system level tests in order to have confidence in our strategic systems. It is also necessary to conduct, of course, large tests to evaluate weapon effectiveness.

The confidence which we have in our deterrent forces and our command and control systems is absolutely and unequivocally based upon the outcome of our underground radiation effects tests. There is no other way of doing it.

The future program must continue because hardening technology must keep up with the system technology. The microchip is just an example of that. We get it all sorted out for a certain kind of guidance and electrical system, and the system designers develop a new kind of microchip and guidance system. So as we develop hardening criteria they develop new systems.

We are trying to catch up with the technology, and maintain the survivability of our systems, our new systems, and our modifications to those systems. This is the ever-increasing role of DNA's underground effects test program.

The coupling ground shock and effectiveness of the strategic systems has never been sorted out. The new systems being fielded today by the United States are far different from those systems on

which we conducted enough tests to really evaluate them. That must be done, especially if we start reducing the number of systems out there, as in the START talks.

With all of those requirements it is intuitively obvious that the program is highly stressed.

Thank you, gentlemen.

Senator EXON. That was a very interesting presentation, Dr. Atkins and Dr. Linger, and we appreciate it very much.

I have several questions but I would be glad to yield at this time to my colleague from South Carolina, if he wishes to begin questioning.

Senator THURMOND. Thank you very much, Mr. Chairman.

We are very pleased to have you gentlemen, and this is most interesting and very helpful.

Dr. ATKINS. Thank you, sir. It is our privilege.

TESTING OF SYSTEMS

Senator THURMOND. What modern systems are included in your reference to examples of systems that successfully passed all component and subsystem test only to fail when tested as a full system? And could you also tell the committee what the effect would be on the effectiveness of those systems if problems had not been detected in underground testing?

Dr. ATKINS. Yes, sir. Let me speak briefly to that and then I would like to submit more information for the record.

The one system which Dr. Linger showed which did not exhibit any problems when it was first exposed in underground tests was the Minuteman II reentry vehicle, and that was designed many years ago and tested many years ago when the field of reentry vehicle technology was in its infancy.

That system happened to be overbuilt by current standards, so it was a flying system that was more or less built like a tank and it is not surprising to us now that it did not show any problems. As a general rule of life, the more sophisticated you build a piece of hardware, the more likely it is to show up problems in areas like hardness, and that should not be surprising.

It should not be surprising to anyone that most of these systems exhibited problems in the tests that needed to be fixed; that is why you do full-scale engineering testing. The same fact is true of most modern airplanes, whether military or commercial. Space systems, communications systems, everything has engineering problems when first subjected to full-scale testing.

That is why it is important to do this kind of testing. As far as the impact on military performance, if these problems had not been found in full-scale testing and then corrected, I would like to submit that for the record, if I could, please, sir. That gets into a lot of detail that I would have to research.

[The information follows:]

Dr. ATKINS. Today we cannot confidently certify the survivability and effectiveness of certain systems without the continuing ability to conduct underground nuclear effects tests. Let me give two specific examples. The first one concerns a survivability design technique used today, known as circumvention/reset, in which critical electronics shut down upon sensing a radiation environment and then restart after the pulse of radiation passes. There are new systems being considered that

cannot tolerate this down time and must be able to operate through the exposure to ionizing radiation if they are going to successfully perform their intended function. Extensive radiation testing will be required to achieve confidence in our ability to operate through. The second example concerns the effectiveness of present and future weapons against deeply buried, hardened targets. We have already initiated a series of tests to answer critical questions about energy coupling, ground shock, and cratering.

Today satellites use a constrained design philosophy in which the electrical survivability of a given component or subsystem is obtained by the application of hardening technology in design practice or by use of hardening devices that limit the current and voltage to the item. The components and subsystems are individually tested at electrical stresses at and above these design values. It is assumed that, if the components and subsystems survive their tests, the system as a whole could survive a similar test. This has not been our experience with over 90% of the major systems that were exposed at full scale during tests following rigorous analyses and extensive laboratory simulation testing. We have had numerous surprises in these full-scale tests, and these were tests of systems electrically much less complicated than a typical satellite. Therefore, as a minimum, we feel it essential to demonstrate the validity of the constrained design approach with a few full scale satellite tests. When that is completed, it may be unnecessary to subject all critical satellites to full-scale tests.

The full system test validates the adequacy of a design. One must carry that design into production and later into deployment without compromising the nuclear survivability features. There are numerous test procedures developed for each weapon system to assure that nuclear survivability is maintained throughout the life of the system. This discipline is known as Hardness Assurance/Hardness Maintenance, or HAMS, for short. There are elaborate test programs designed to assure the quality of components and subsystems in the stockpile. To date we have not found it necessary to repeat the system level underground tests using articles withdrawn from the stockpile. There is always the possibility that a survivability issue may arise in the future that can be resolved only by system level testing.

Then there is a question about yields. The vacuum line of sight pipes we use in underground testing are tapered, becoming larger in diameter the further they extend away from the nuclear source. We have learned from experience that the angle of this taper must be kept quite small to assure containment of the explosion products. Large test articles require pipes well over a 1000 feet in length in order for them to fit within the exposure area. Future satellites are envisioned to be far larger than anything we have previously tested and may require vacuum pipes over a mile in length. Higher yields will be required to achieve the desired exposure level at these distances.

Successful achievement of Inertial Confinement Fusion (ICF) should provide an important addition to our capability to simulate nuclear weapons effects. However, the energy released by a nuclear weapon is substantially different from that of an ICF pellet. Specifically, a typical nuclear weapon releases [deleted] of its energy in the form of x-rays. The military systems being tested in our underground nuclear test program are primarily concerned with the effects of these x-rays. The ICF pellet, on the other hand, releases roughly 80% of its energy in neutrons with only about 15% of the energy being relatively hard x-rays. That means that meaningful x-ray exposures from an ICF source will be accompanied by an intense pulse of neutrons which is an unacceptable variation in radiation type for simulating modern nuclear weapon effects. Other concerns include fluence uniformity and debris. The fluence on an underground test is essentially uniform over the entire exposure chamber, while the fluence from an ICF source could vary by as much as a factor of two over a test article the size of a reentry vehicle. The underground nuclear test is free of any nuclear debris. Roughly 5% of the energy from an ICF is carried by the debris of the exploding pellet. While 5% may seem small, it is unacceptable for many of the experiments we routinely perform today. The likelihood of achieving ICF might more properly be answered by DOE, but we would estimate a cost of \$1-\$5 billion to develop a system that would have some utility for effects testing. The likelihood of success is largely dependent on decision by DOE to advance the program.

Proliferation of numbers of systems is one way to improve both survivability and effectiveness. Substantial reductions in numbers of systems, as proposed under START, will eliminate this option. As the numbers are reduced, each remaining system will bear an increasingly larger share of the deterrent value, thus the assurance of survivability and effectiveness of each system will increase in importance. In

the foreseeable future, that assurance of survivability and effectiveness will depend, in part, on our ability to conduct underground nuclear effects tests.

Senator THURMOND. Do you have anything else to add on that?

Dr. LINGER. No, sir.

Senator THURMOND. Dr. Linger, should we assume once the system has been successfully tested underground that no future nuclear effects testing is required for the reliability of the program?

Dr. LINGER. Hardness maintenance is a key issue in the system. Systems that have been out there for some long period of time undergo continuing maintenance and operational changes. And if there are major operational changes, they need to go back, just like your car needs to go in for a lube and oil change. They need to go back in and see if in fact they still meet the survivable requirements that they were originally designed to meet.

SIMULATORS

Senator THURMOND. Dr. Atkins, you indicate in your testimony how our simulators, cannot provide the time-phase combined environments of a nuclear detonation and cannot currently provide the test volumes and radiation dosage rates needed for many systems level radiation tests. In the Department of Energy portion of the subcommittee's jurisdiction we review the inertial confinement fusion program. Is there any near or far-term potential for this technology to provide the necessary nuclear environments and what is the cost and likelihood of such an achievement?

Dr. ATKINS. Sir, let me throw a viewgraph on the screen. Dr. Linger had some backup material on the ICF.

[Figure 40 deleted]

This chart shows the potential of a particular type of inertially-confined fusion equipment which we have been talking with Livermore seriously about. The biggest problem that we see is availability. Inertially confined fusion is a wonderful idea. It has not been reduced to practice in the laboratory on any usable scale, and a prudent believer in testing should not depend on its existence at any particular time in the future.

INERTIAL CONFINEMENT FUSION

Senator EXON. What is inertial confinement fusion? For the lay people, what is that?

Dr. ATKINS. The concept is that you take a very small, solid capsule, very small—perhaps one millimeter, pinhead size—a sphere of heavy metal. Inside that microballoon is a fusionable gas, a deuterium-tritium mixture. Then there are two or three different concepts for making that very small microballoon implode similar to the way that the primary of a nuclear weapon implodes.

If you happened to see Day One on television last night, they talked at length about the invention of the implosion process during the Manhattan Project. So one of the mechanisms which has been worked on to make this microballoon implode is laser energy. You shine laser energy on the surface of that little pinhead, which is made in a very elaborate manner, and you irradiate it uniformly with laser and make the thing implode and then the

gas inside fusions and is like a very small thermonuclear weapon in the laboratory.

It can put out x-rays, which we are interested in. The percentages here show the types of energy which these various forms of weapons put out. [Deleted.] An inertially confined fusion device might put out 15 percent.

The ICF is very heavy in neutron output, quite heavy in debris. We would worry that samples that we were trying to expose in an ICF facility would be impacted as much by debris as they would be by the realistic forms of energy which we are interested in. The biggest risk in thinking about ICF, inertially confined fusion, as a simulation mechanism is that it is a long way in the future, if ever.

We stay close to the project at Livermore. Admiral Parker was out there just a couple of months ago, looking over the progress in research in detail with the scientists at Livermore. It appears to us that it is a long way in the future. It might not ever work, and I think that they would agree with that statement.

Senator EXON. So it is best to summarize it as an experimental project?

Dr. ATKINS. It is an experimental project. We simply cannot depend on it at this point. We will certainly use it if and when it exists. We are, as I say, keeping close to the research.

It will be wonderful if it does work, but we do not know when.

Senator EXON. Thank you, Senator Thurmond.

Senator WALLOP.

Senator WALLOP. Thank you, Mr. Chairman.

THRESHOLD TEST BAN TREATY

Let me add my thanks for a genuinely interesting briefing. I am informed, going to the protocol talks, that the U.S. monitoring protocol to the Threshold Test Ban Treaty concerning non-standard tests—and I throw that up in sort of quotation—which would affect certain tests that your agency conducts, these provisions would. [Deleted.]

Dr. ATKINS. Yes, sir, Senator Wallop. It certainly could happen that way. We would hope it does not. Let me explain the standard versus non-standard configuration argument.

The Department of Energy's underground tests for nuclear weapons development are considerably simpler than the tests which we have showed you this afternoon in that they drill a vertical hole in the ground, typically 1,500 to 2,000 feet deep, drop the nuclear test device down in that, with perhaps 200 channels of instrumentation cables, and then fill that vertical hole up with concrete, with the original ground and rock material and so forth, so there is no line of sight to the surface.

The number of channels of instrumentation on a test is typically one-tenth the number that we use on DNA's effects tests, and DOE's tests are all basically quite similar to each other. The type of test the Department of Energy executes are routinely done [deleted], I believe. That is called a standard configuration. That configuration is particularly amenable to monitoring by the CORRT-TEX method, which we believe is a very high confidence method of determining yields from underground tests.

Types of Underground Nuclear Tests

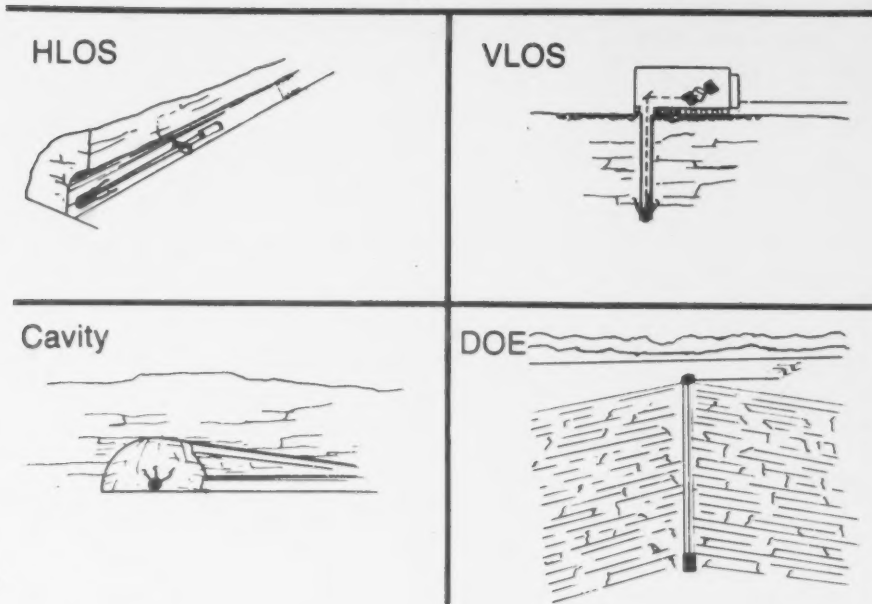


Figure 41

The standard kind of DOE test is at the lower right in this picture—the other three diagrams are what we showed you earlier. Our tests have much larger empty space in them. In the lower left you see the hemispherical cavities similar in size to the Capitol dome. The upper left you see the 1,000-foot to 2,000-foot long vacuum pipe and so forth. So there is a lot of empty space in these effects tests, and that makes it more difficult to use CORTEX instrumentation to measure the yield.

[Deleted.]

Senator WALLOP. But, though, just assuming a less than perfect world and one in which U.S. self interest was there, would it conflict with the requirements for nuclear testing?

Dr. ATKINS. We certainly see the necessity to test above [deleted.] As Dr. Linger showed, one of the outstanding requirements now is to do underground tests in this hemispherical cavity geometry of operational weapons at or approximately at the 150 kt limit, so that we can measure the actual coupling into the ground of the energy from those higher-yield weapons.

Senator WALLOP. And it will have a lot of effect on those tests of which you have been speaking today with regard to system survivability?

Dr. ATKINS. Yes. Survivability and effectiveness.

Dr. LINGER. This would have a profound effect, sir.

Senator WALLOP. Do you have a say in how those things, the U.S. proposals, how they would affect U.S. needs?

Dr. ATKINS. Certainly we are in constant communication with the people in the Office of the Secretary of Defense and the Joint

Chiefs of Staff who are part of the senior level government group that decides the negotiation policy. So we get our word in vigorously on these issues.

UNDERGROUND TESTING

Senator WALLOP. Well, Dr. Linger, so long as we have nuclear weapons as part of our deterrence can the United States—and when I say “we” I am talking about conflicting powers—can the United States test and deploy defensive systems, ground or space, without nuclear testing?

Dr. LINGER. No, sir, I do not think so. I do not think that anyone can guarantee the survivability of any large system without an underground nuclear test capability. It would be extremely difficult and probably impossible to guarantee the survivability and operation ability of such a system.

Dr. ATKINS. A system that has to operate in a nuclear environment.

Dr. LINGER. I would add this, that we talked about systems that have to operate in space and survive in space. We are talking mainly about SDI and SDI-type systems. I would say that I think that you have to carefully consider why the Soviets have fielded and actively have such a vigorous underground program. [Deleted.] And they may have their own, I will call it low tech, SDI system already in place.

So I think for their part they might give up the testing because they have already got the system in place.

Senator WALLOP. Thank you, Mr. Chairman. If there is time, I may have another question.

Senator EXON. Yes. We will have a second round.

To follow up on the questions that were just being asked by my colleague from Wyoming, we are continually pressed around here by those who claim that all of this testing is not necessary. Some of this I have just dismissed as the theory by some well-intentioned souls have that maybe we do not need all of this testing. You have to separate that from another group that I think is taking that approach because of what I think is a totally misguided notion that we would just end all testing and then the world would be a lot safer place in which to live.

I take it that you can categorically say that that would not be the case and that we absolutely need testing and would not gain from any further restrictions on it. Have I overstated the case or have I stated it about where you come down?

NECESSITY OF TESTING

Dr. ATKINS. Sir, I fully agree with what you said. I believe that we will need nuclear testing to the limited extent that we do it now into the foreseeable future, as far into the future as I can look.

The democratic nations depend on nuclear weapons as the cornerstone of their defense because they cannot afford the economic cost or the social cost of large standing armies compared to the Soviet Union. We must continue to have nuclear forces. I wish I could see the time when world peace would break out and we could stop worrying about this, but I cannot right now.

Nuclear testing itself adds no risk to the world, as far as I can see. It allows us to have greater confidence in our forces. It allows the Soviets to see that we have confidence in our survivability, the operability of our forces. The Soviets' perception of our strength and our confidence is a major element of deterrence.

I simply cannot see how elimination or reduction of nuclear testing itself would help at all.

Senator EXON. Thank you, Dr. Atkins. Let me ask you a question. An incident in which one of your underground tests experienced a failure of rock and/or the blast doors to cut off the nuclear effects was reported in the press. The news reports, drawing on DNA sources supposedly in Nevada, characterized this as evidence that safety margins for such tests were too small.

Dr. Atkins, is that how the test should be viewed? Give us your report on this incident and what your views of it are.

Dr. ATKINS. Yes, sir. Let me say some things and then I would certainly invite Dr. Linger to speak to this also.

The incident referred to was in the test which we named MIGHTY OAK, which was executed early in 1986, during which there was considerable leakage of radioactive gases from the area of the device into the cavities where the experiments were located, as you saw in some of the pictures. We showed you pictures of tests where all of the test items came out very clean as far as radiation from the device was concerned, and in fact in many of those we walked back in the next day and recovered the experimental hardware.

In the MIGHTY OAK test there was some seepage from the area of rock in the first 500 feet from the device going out toward the target items. The exact location of the seepage we have been unable to determine. We have some evidence of it, but if we could find it exactly I am not sure that that would help completely.

There have been a total of about 30 underground tests of this type, these horizontal vacuum pipe tests, beginning in the early 1960s; as a matter of fact as a junior fellow I worked on the first one out there myself. There has never been significant leakage to the atmosphere of radiation or radioactive materials from any of these horizontal tests, and in fact there has been none in the last 15 years or so.

Senator EXON. Including this one? Including the one I referred to?

Dr. ATKINS. That is right. Some of the news reports have correctly stated that there was venting of radioactive gas from that shot and that indeed did occur. Some days after the test we did a controlled ventilation of the tunnel with people from the Environmental Protection Agency standing by with their monitoring instruments. All possible safeguards were taken because we had to get rid of the radioactive gases. In fact, the levels of radioactive gases that were vented to the atmosphere were well below EPA's limits for such activities. So that was not a problem.

As far as the question whether there was not enough margin of safety, it is very difficult to answer that precisely because there has not been enough experience to have stated safety margins in the same sense that an aircraft designer uses.

There were a couple of areas where we could make changes that we believed would make the risk even less of any venting or of loss of equipment as we had in that test, and we did make those changes in subsequent tests and have had no problem since MIGHTY OAK.

Senator EXON. My time is up, but if you could and if you would care to add to it you can.

Dr. LINGER. Very quickly. Mother Nature did not build everything in a homogeneous isotropic manner. We are all aware of that. We have all seen rocks.

Senator EXON. Is it possible we could pass a law to make Mother Nature comply? [Laughter.]

Dr. LINGER. If we could, it would help us, sir.

What we have done because of the vagaries of the way Mother Nature builds a mountain, is to provide three degrees of redundancy. That is to say we have belts and suspenders three times. If it leaks by, as it did in MIGHTY OAK, and gets down to the test chamber, we have a blockage which prevents it from going any further. If it happened to, because Mother Nature's vagaries let it go past the first one, we have two more. I have shown in figure 8 only one overburden plug, but we have several of these in different containment vessels.

So the only time that we have a release of radioactive material is a controlled, filtered release where we have, as Dr. Atkins said, the environmental people standing by and the minute it becomes too much we shut it down.

Senator EXON. Suffice it to say, then, you feel there is enough redundancy in the system now?

Dr. LINGER. Yes, sir, absolutely.

Senator EXON. Thank you.

Senator Wallop.

Senator WALLOP. Thank you, Mr. Chairman.

Dr. Linger, could you explain to the committee why it is important to test critical defense satellites at the system level rather than at the component level?

Dr. LINGER. Yes, sir. I would love to answer that. One of the difficulties is after we have done tests on the systems and subsystems components, we hook them all together when we do a full systems test. There are so many little things that have often been overlooked or there is a new technology, that the whole system fails and needs to go back for redesign.

This has happened on all but one reentry vehicle system. When we developed the hardening technology for satellites, the satellite people took it and ran with it and said "we will make hardened satellites," but they never brought one back to see whether they did. If we depend upon those satellites for our communications and systems that have to survive in the nuclear environment, we have to know if they are survivable. And right now we do not know.

Senator WALLOP. How does that translate into the need for higher kiloton testing?

Dr. LINGER. The satellites in general are very, very large, and the larger that thing gets, and the farther away we get with a device that radiates it, because remember it is coming out as a cone and that line of sight pipe gets bigger and bigger and it has

got to go then several more thousand feet to get big enough to irradiate that entire satellite. So that means you have to have a bigger test device on the front end.

Senator WALLOP. Thank you very much.

I hope that guides us a little bit in some of our future amendment forays that we have, because the next question I have for Dr. Atkins is about an amendment foray from last year you may recall. The DOD conference report requires that the Department of Energy, in connection with DOD, establish a nuclear test ban readiness program in the event the U.S. and Soviet Union limit tests to very low yields in the 5 to 10 kiloton range or to engage in a comprehensive test ban plan.

So long as we have a nuclear deterrent, irrespective of low yield or comprehensive test ban, can DNA carry out its mission and ensure that our deterrent is survivable and effective under such a program?

Dr. ATKINS. We would certainly be seriously limited in our ability to assess both survivability and effectiveness if we were restricted to less than 150 kt. The lower the threshold, of course, the more severe the limitation becomes.

Senator WALLOP. Do you get down to 5 to 10 kilotons?

Dr. ATKINS. I would be right up front with the fact that most of the effects tests that we have done in recent years have used [deleted]. However, there are very critical needs which we have discussed this afternoon which will require substantially more, and in fact right up to, the 150 kt limit.

So I think that reduction of the threshold in the Threshold Test Ban agreement would be a severe limitation on our ability to assure survivability and effectiveness.

Senator WALLOP. Thank you both very much. It has been an interesting afternoon. I appreciate it.

Senator EXON. Thank you very much, Senator Wallop.

Gentlemen, respected experts outside your agency have concluded, as I understand it, that so-called system levels tests have been highly effective in exposing otherwise unforeseen vulnerabilities to nuclear effects.

On the other side, some satellite designers claim that proper design can obviate the need for systems level test. Could you briefly explain the difference between component and system level testing and comment on this controversy and review, if you will, our own experience in this area?

Dr. ATKINS. Yes, Mr. Chairman, I would be delighted to say as much as we know at this point.

We, along with a number of other organizations in the country—and I am happy to say we have had the lead in some of these activities—are continually trying to develop engineering knowledge and analysis and laboratory testing techniques so that we can improve our ability to design and build hardened systems with confidence, without the need for full-scale nuclear testing.

It would be highly desirable to do this from a cost standpoint as well as from, of course, our concern that we might not be able to do these tests forever. In every field of engineering tremendous advances are being made. I was told recently by some people from Boeing about the great job that had been done on the very non-

symmetrical air inlet for the latest generation of the 737 airplanes, where they were able to take very sophisticated three-dimensional computer codes, similar in fact to the codes which we use to calculate a number of weapon effects problems, and calculate the air flow at near sonic speeds into this odd-shaped engine inlet in a manner that would just have been impossible even 10 years ago. They came out right on the money when they did wind tunnel and then flight testing.

That kind of thing is happening everywhere in engineering and we are in the forefront in our area, I believe, in learning to improve these processes.

Some people are more enthusiastic than I believe most of the experts at the Defense Nuclear Agency are, in their ability to right now take analysis methods and small-scale laboratory experiments and extrapolate the knowledge that they get from those techniques into full scale with confidence. We still believe that with our present state of knowledge and technology if you want to be sure that something is going to work in a given environment you ought to test it in that environment. That is what the technical argument boils down to.

Senator WALLOP. Sir, would you allow an observation?

Senator EXON. In just a minute. Aren't we right back to the situation that it certainly is well that we are doing experimentation and making significant advances in engineering, but I guess what you are saying, to be cautious, is that this is not going to be workable as soon as some people might like?

Dr. ATKINS. That is right, Mr. Chairman. The people from Boeing were justly proud of the job that had been done with the computers in analyzing that new engine for the 737, but I am glad that a test pilot tested it out before I had to take a ride on it.

Senator EXON. Did you have a comment, Senator Wallop?

Senator WALLOP. I was just going to make that very observation, that the most interesting part of that comment was not that the computer data came out right on the money but that it proved out when they did wind tunnel and flight testing. They obviously did not have yet enough confidence in the computer to abandon either of those two steps.

Dr. LINGER. And they always flight test everything and, of course, that is really what we are saying, that these things, before they are deployed, need to be flight tested.

SYSTEM LEVEL TEST

Senator EXON. While I have some additional questions to submit to you—I would like to get into the impact of the system level test on the required test yield. Granting for the sake of argument that the system level testing is necessary to accurately assess survivability, why do systems level tests require high yields? What sort of yields are we talking about in this area?

Dr. ATKINS. For large space systems, 100 kilotons or perhaps even up to 150. Those are the only examples we have.

Dr. LINGER. Before we will be able to get an entire space system illuminated, the device size and the distance from the device will dictate the size of the beam. This is a containment problem. To

guarantee containment means that we end up with this large device driving the radiation down the tube. If we are to ever do the full system testing for hardness, we have to have the capability of using larger devices. I guess the thing that bothers both Dr. Atkins and me and all the rest of our team is that we really do not know. I mean, in 1983 we had no idea of the Soviet underground facilities and now all of a sudden they are out there and there are a lot of them.

It is almost impossible to say what it is that we are going to have to be able to test against. So cutting ourselves off at the knees now is not the best way to run the race.

Senator EXON. Thank you. Any further questions?

Senator WALLOP. No, Mr. Chairman. Thank you.

Senator EXON. Gentlemen, I want to thank you once again for your excellent presentation. It has been very, very helpful. We appreciate it.

The kinds of things you are telling us here today help us a great deal as we continue to provide for the maintenance of an adequate testing ability, which is the bottom line, for maintaining our nuclear deterrence. This is very important, in my view, but some of our colleagues do not share that enthusiasm.

I have been advised that Senator Thurmond will submit the rest of his questions for the record. So with that thanks again and we are adjourned.

[Questions for the hearing record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR J. JAMES EXON

THE IMPACT OF SYSTEM-LEVEL TESTS ON REQUIRED TEST YIELD

Senator EXON. Granting for the sake of argument that system-level testing is necessary to accurately assess survivability, why do system-level tests require high yields? What sort of yields are we talking about?

Dr. ATKINS. I'll answer the second part of your question first. We may require yields of 100 kt or even 150 kt. Now to the question of why we may need such high yields. On our radiation tests we use a vacuum line of sight pipe that provides a space environment between the nuclear device and the test objects. This pipe is tapered, measuring less than a foot in diameter near the nuclear device and growing larger as the pipe extends away from the device. The angle of this taper must be kept quite small in order to ensure containment of the nuclear debris in the cavity that is formed by the explosion. To provide the exposure area required for some very large satellites, the test chamber may have to be very long distances from the nuclear device. Because of these great distances, large yields may be required to provide the desired fluence levels.

POTENTIAL CONTRIBUTION OF ICF

Senator EXON. An ad hoc panel of experts convened to review testing capability is reported to have concluded the following: DOE's Inertial Confinement Fusion program in principle could satisfy most or all of your survivability effects testing needs. They went on to note, however, that the technical feasibility has yet to be demonstrated, and observed in particular that the power levels of the lasers driving the fusion reaction demonstrated thus far are far below the level required even for a laboratory facility, and that the program will come to fruition, if at all, no sooner than 15 to 25 years in the future. Can you elaborate on this issue technically?

Dr. ATKINS. Successful achievement of ICF would provide an additional method of simulating nuclear effects, but I am not prepared to say it could satisfy all, or even most, of our survivability effects testing needs. A nuclear device emits [deleted] of its energy as x-rays with the neutrons accounting for approximately 5 percent of the total energy release. We are primarily concerned about the effects of these x-rays on systems in our radiation tests. Unlike a nuclear device, an ICF pellet releases 80 percent of its energy in neutrons and only about 15 percent in relatively hard x-

rays. The kinetic energy of the debris from the pellet accounts for the remaining 5 percent of the energy. This distribution of radiation and kinetic energy is much different from that of the modern nuclear weapon and would be difficult to use effectively to correctly simulate nuclear weapons effects. To achieve meaningful fluences of x-rays from an ICF pellet, the test article will have to be placed within a few feet of the pellet. This will restrict the size of the hardware that can be tested. An exposure to a meaningful level of x-rays from the pellet will be accompanied by an intense flux of neutrons and by debris impact, both of which are not acceptable for many tests. We concur with the ad hoc panel that success of a usable ICF facility, even with these limitations, is problematical.

VULNERABILITY OF STRATEGIC FORCES TO ELECTROMAGNETIC PULSE

Senator EXON. We've known about electromagnetic pulse from high-altitude nuclear burst for a long time, but because of the atmospheric test ban, I understand that our real knowledge of the phenomenon and our ability to test the vulnerability of strategic systems to its effects is quite limited, and that modeling and simulation are fraught with uncertainty. Do we have any potential weak links in our strategic forces and the C³I systems supporting them in terms of vulnerability to EMP?

Dr. ATKINS. We place all long line networks in the weak link category as regards EMP survivability. The huge geographic areas encompassed by these networks precludes confident testing of the effects of simultaneous EMP exposure of networks. For this reason, the DOD has developed radio link overlays such as GWEN and does not depend on commercial telephone or power utilities for critical strategic operations.

Because our EMP simulation and analytic modeling capabilities are limited, we have devised a conservative, low risk system protection approach, wherein critical electronics are enclosed in tight electromagnetic shields. This approach is relatively insensitive to the EMP level and thus we need only verify the integrity of these shields to have confidence in system EMP hardness (standard shielding integrity checks are available, do not involve large area threat level illumination, and can be performed using portable equipment). It is not possible to reliably verify or maintain the hardness of systems which do not employ this low risk approach. Most strategic weapon systems and new time urgent C³ systems have adopted this approach. The hardness status of the remainder of these facilities remains unknown. We are not predicting massive failures, but potential weak links cannot be ruled out. This situation can be expected to improve with time as more low risk hardened facilities come on line.

The Defense Communications Agency, DNA, and the Military Departments are preparing a mandatory EMP protection and testing standard for these time urgent, ground-based C³I facilities which will be based on the DOD-STD-2169 environments. This standard (MIL-STD-188-125) mandates a low risk protection approach and should be ready for issue in less than a year. In addition, the DNA has initiated a comprehensive program to assist user agencies with the implementation of the new standards.

ADHERENCE OF DOD PROGRAM MANAGERS TO SURVIVABILITY REQUIREMENTS

Senator EXON. In your view, as a tester, is there sufficient adherence by DOD program managers to the letter and spirit of DOD Directive 4245.4 as far as nuclear survivability testing is concerned? Does DOD tend sometimes to bypass or ignore this directive? Can you give us your opinion as to why this might occur and what the consequences might be?

Dr. ATKINS. DOD policy requires acquisition managers to address nuclear survivability in all phases of the acquisition process for major and non-major systems that must perform during nuclear conflicts. DODD 4245.4 states that it is DOD policy that nuclear survivability shall be included in the concept formulation, design, development, production, implementation, and operation of major and non-major systems that must perform critical missions in nuclear conflicts. I don't think this directive is ignored or bypassed. But there can be honest disagreements about how much testing is enough. DOD system program managers must make trade-offs between the level of mission capability and weapons system cost. Nuclear survivability testing competes with all other mission requirements, such as reliability and maintainability, in determining the optimum weapon system configuration for the dollars available. We try to work closely with the program managers in making these trade-offs. In addition to working with the program managers, the Defense Nuclear Agency advises the Deputy Director, Defense Research and Engineering (Test and Evaluation) and the Director, Operational Test and Evaluation who must confirm a

system's survivability and effectiveness via appropriate testing and evaluation. DNA also assists the Assistant to the Secretary of Defense (Atomic Energy) in preparing for DAB reviews where appropriate.

ABILITY OF SDI'S ELECTRO-OPTICAL SENSORS TO "SEE" THROUGH HIGH ALTITUDE BURSTS

Senator EXON. I have been told that high-altitude nuclear bursts would cause a tremendous increase in the intensity of the infrared and visible light background against which SDI's electro-optical sensors for tracking and discrimination would have to operate. I'm told, too, that the effects of one burst can last a long time and cover a very large area. Can you describe this phenomenon and assess its severity? Is it confined to the optical portion of the frequency spectrum, or are radar frequencies vulnerable as well?

Dr. ATKINS. High altitude nuclear bursts can indeed create high intensity clutter backgrounds at ultraviolet, visible, and infrared frequencies that degrade the performance of sensors. The weapon radiation and the weapon material interacts with the atmosphere to create large amounts of ionization, and excited atmospheric constituents, all of which radiate in various wavelength bands. The area coverage and duration depends on the specific details of the system and the nuclear scenario, particularly the sizes and numbers of nuclear bursts. In general, it requires tens of hundreds of bursts to create intense backgrounds over large areas and significant times. These bursts could come about by a variety of ways. They could be direct attacks on our space assets with nuclear weapons where the backgrounds are collateral effects. Sizable numbers of weapons could also be employed as precursor attacks where the bursts are deliberately detonated to degrade our sensor and communications systems. Salvage fuzing is another mode that would involve many high altitude nuclear bursts. In this case, enemy weapons are fuzed to detonate if they are struck by our defensive weapons. The resulting nuclear effects would then make it more difficult to attack other weapons. The utility and value of these various attack modes are currently under study by the SDI, where a variety of nuclear and non-nuclear enemy options are being considered. Considerable work is also looking at methods to reduce and avoid sensor degradation and accomplish key sensor missions in high altitude nuclear environments.

The greatly enhanced ionization from these same nuclear environments that create sensor backgrounds also can significantly degrade communications and radar systems operating at radio frequencies. The specific impact of any given scenario is strongly dependent on the specific system and mission. For example, communication is easier than radar sensing in high altitude nuclear environments. For radars, discrimination between weapons and decoys is more difficult than acquiring and tracking targets. The SDI is investigating the effects of high altitude nuclear environments on communications and radar systems and is seeking ways to maintain critical functions in the presence of nuclear bursts.

NEED FOR HIGH YIELDS IN SYSTEM TESTING

Senator EXON. In your testimony before the committee, you indicated that full system tests require large tube diameters to expose the system to realistic radiation levels, and that to achieve large tube diameters safely it is necessary to enlarge the opening slowly over a long distance. It was explained further that large yields are required to traverse the length and breadth of such tubes with sufficient levels of radiation. The next logical question is why, from an engineering standpoint, you cannot simply focus the radiation better, or rapidly enlarge the tube opening, or use some other technique to break the dependence of system-level tests on high-yield devices?

Dr. ATKINS. I will address the issue of focusing radiation first. We have stated earlier that we are primarily interested in x-ray radiation. In a nuclear device the x-rays are created in a small volume and flow outward in all possible directions. Any attempt to focus the x-rays after they have been created will only degrade their intensity, and therefore defeat the purpose. Now to the issue of opening the pipe up faster, or increasing the angle of the taper. From theoretical calculations and from pragmatic experience we have learned that the angle of the pipe taper must be kept quite small to assure containment of the explosive products. For these reasons, the size of the test article will determine the required length of the pipe and the desired exposure intensity will determine the required yield.

QUESTIONS SUBMITTED BY SENATOR STROM THURMOND

SYSTEMS PASSING COMPONENT AND SUBSYSTEM TESTS

Senator THURMOND. What modern systems are included in your reference to examples of systems that successfully passed all component and subsystem tests—only to fail when tested as a full system? Could you also tell the committee what the effect would be on the effectiveness of those systems had problems not been detected in underground testing?

Dr. ATKINS. The MK-12a reentry vehicle on the Minuteman III ICBM was tested on two underground tests with unacceptable results in both cases. This vulnerability was accommodated by deployment spacing between reentry vehicles and no additional corrective action was required. The Trident C-4 post boost propulsion system experienced an electrical burnout when initially tested. A component change was required to fix this deficiency. I might add that the hardened component used to fix the problem was developed by DNA as part of our technology base program. More recently there was a surprise uncovered in the D-5 Trident II missile equipment section that was not found during the above ground testing. This problem was corrected by changing the logic used to recover from electrical upset caused by x-ray exposure. The impact of these failures on operational effectiveness of these systems is scenario dependent. One must examine the threat against these systems today and project what it will be over the deployment life time. Each of the services has an independent group that establishes nuclear design criteria for those systems that must function in nuclear environments. These criteria are based on threat projections and reasonable excursions and on the system concept of operations. These criteria then establish the test parameters. Had the systems cited above been operationally exposed to the nuclear environment specified in the design criteria they would probably have failed. That is, they would have had no effectiveness.

CRATERING RESEARCH

Senator THURMOND. What implications has your work on the size of nuclear weapons related craters had on our assessments of the vulnerability of U.S. and Soviet ICBM silos?

Dr. ATKINS. As a result of our cratering research, craters and crater related ground motions are now [deleted]. In particular, nuclear craters in [deleted] have [deleted]. This [deleted] in crater dimensions permitted superhard [deleted] silo designs for both the MX and SICBM. Prototype silo designs capable of surviving up to the crater's edge were demonstrated in DNA, and Air Force-sponsored tests. However, the hardness assessment of operational U.S. and Soviet silos remain largely unaffected because [deleted] they are designed to a hardness level where the airblast loading is the dominant kill mechanism.

ASSESSING GROUND SHOCK

Senator THURMOND. What is the current status of your underground test work on ground shock coupling of militarized weapons? Do we have a confident assessment based on testing for each of the modern weapons on which our deterrent capability would depend with or without a START agreement?

Dr. ATKINS. To date, no underground nuclear tests have been conducted to assess ground shock coupling from a militarized weapon. The limited ground shock coupling tests that have been conducted employed low yield experimental devices and focused on but a few of the physics issues pertaining to the coupling process. Convincing technical arguments can be made to suggest that the ground shock coupling of a modern militarized weapon cannot be realistically simulated at low yield [deleted]. The associated uncertainties weigh heavily on our assessment of the effectiveness of our nuclear arsenal against the suite of Soviet deep underground facilities. DNA is planning to conduct a ground shock coupling test with a militarized weapon under the assumption of a favorable test budget. [Deleted]

NEED FOR HIGHER YIELDS IN NUCLEAR EFFECTS TESTING

Senator THURMOND. Your need for higher yields for nuclear effects testing seems related in part to deep structures. What is the status of our current level of understanding of weapons effects against deeply buried structures? What is the importance of obtaining a better understanding of these effects in the future, with or without a START agreement?

Dr. ATKINS. Our understanding of the response of deeply buried structures is severely limited due to lack of relevant test data. While DNA has conducted several underground nuclear structures tests during the past 25 years, none were performed

in geologies applicable to current targeting interests, the loadings were horizontal rather than vertical, and the test yields were too small to achieve a high fidelity simulation. At present we have only a qualitative understanding of the influence of geologic details and construction techniques on tunnel response to nuclear ground shock loadings. These uncertainties translate to large variations in the weapon assets needed to hold these targets at risk. DNA plans to address the present data deficiencies with both high explosive simulation techniques and underground tests in representative geologies. Because of the significantly enhanced ground shock coupling of earth penetrating weapons, compared to surface bursts, any simulation of an EPW ground shock using reasonably large-scale structures will require a large yield [deleted] nuclear source.

TESTS TO RESPOND TO THREAT CHANGES

Senator THURMOND. It seems to me that just as our nuclear weapons may have to improve to respond to changes in the Soviet threat—with or without a START agreement—so too we must be able to test the reliability, survivability and effectiveness of new weapons designed to respond to threat changes. Do you share that view, and what does that say about a continuing ability to conduct underground nuclear effects testing?

Dr. ATKINS. The past 15 years of DNA underground nuclear testing has predominantly consisted of horizontal line-of-sight tests. In these tests missile and reentry vehicle components and space systems assemblies are exposed to the x-ray environments characteristic of exoatmospheric pin-down and ABM interceptor threats. In essentially all of these experiments potentially lethal vulnerabilities have been discovered that were not theoretically predicted and came as a complete surprise. Under START limitations the viability of the U.S. nuclear deterrence policy depends even more strongly on our confidence in the survivability of the remaining nuclear assets. We must continue to validate both current and new systems against an ever growing spectrum of threat environments, including nuclear-pumped direct-energy environments. Because of the intense energy requirements, many of these environments will never be simulated with non-nuclear means.

Additionally, we must concern ourselves with the effectiveness of our nuclear weapons against an increasingly sophisticated target set. For example, only recently did we come to fully appreciate the extent of the Soviet construction program in deep underground facilities and the relative ineffectiveness of our current nuclear arsenal to hold these targets at risk. A critical technical issue in this assessment was the ground shock coupling efficiency of modern nuclear weapons in a contact burst mode. DNA has conducted several low yield nuclear tests in large underground cavities to gain a better understanding of the energy coupling physics. However, there are aspects of this problem that cannot be adequately simulated at low yields. We must conduct additional tests at larger yields and in militarized configurations to resolve the remaining issues. This example as well as others that could be cited underscores the need not only to retain the ability to conduct underground tests but also to minimize the constraints on the test yield and configuration.

SOVIET TESTING

Senator THURMOND. What special concerns does the Soviet interest in a very expensive nuclear weapons effects testing program cause you?

Dr. ATKINS. As you know, the Soviets are very pragmatic about testing, and test more extensively than we in a number of areas missile operational flight test and full scale silo survivability tests, just to cite two examples. I am not concerned that their nuclear testing program might be more expensive than ours. I am concerned that in the course of conducting those tests they may gain some knowledge we don't have that can be used to make their systems more survivable and effective or our systems more vulnerable. For this reason we must closely monitor their activities and strive to understand what they are attempting to do and why they feel it is important.

NUCLEAR HOSTILITIES

Senator THURMOND. Some analysts assume that nuclear hostilities are likely to be initiated with high altitude nuclear detonations to produce electromagnetic pulse effects or EMP. If they are correct, what is your judgment about the resilience of U.S. deterrent forces and their supporting command, control and communications to EMP effects?

Dr. ATKINS. We have reason to believe that weapons platforms themselves which are part of our strategic triad will function satisfactorily in the event of a high alti-

tude burst EMP attack. We stress the importance of EMP hardness maintenance and surveillance to ensure continued survivability.

At present, there is some uncertainty concerning the resilience of our supporting C³I systems. Long line networks are of particular concern because of the inability to simulate EMP over their geographic scales. For this reason the DOD has developed overlay C³ systems which use radio links (GWEN as one example) rather than long lines; and we have taken steps to eliminate dependence on commercial power for our critical strategic systems.

Because of limitations in our ability to predict and simulate EMP effects, in the early 1980s we developed a conservative, low risk hardening approach wherein critical electronics are enclosed in tight electromagnetic shields. This approach is relatively insensitive to variabilities in incident EMP levels. Because of the expense involved (particularly for retrofit hardening), the approach has not been extensively implemented. We recognized that budgets would permit hardening only the most critical C³I links which were identified by the JCS in 1985. DNA, in cooperation with DCA and the Military Departments, is now developing an EMP protection standard (MIL-STD-188-125) which mandates low risk hardening design and test for all critical time urgent C³I.

UNDERGROUND TESTS

Senator THURMOND. [Deleted.]

Dr. ATKINS. The simple answer to your question is yes. Let me elaborate. The underground tests that we conduct provide certain environments that are of interest to us. Specifically, we have a good capability for providing the radiation environment that would occur from an exoatmospheric detonation. Likewise, more recently we have undertaken a series of cavity tests to improve our knowledge of coupling, ground shock and cavity formation. There are other important nuclear environments that we, as yet, cannot produce in underground tests. High altitude EMP and source region EMP are but two examples. [Deleted.]

UNDERGROUND EXPERIMENT

Senator THURMOND. It was recently reported in the press that a U.S. underground experiment suffered unexpected damage when certain doors failed to close and protect parts of the experiment. Could you provide us the details of that test, and your assessment of what occurred?

Dr. ATKINS. In our horizontal line-of-sight tests, we want to allow the nuclear radiation to pass through our vacuum line-of-sight pipe, while closing it off rapidly enough to prevent the fireball and nuclear debris from reaching the experiments. We routinely recover the test articles for post test examination. Essentially, we want to [deleted] closes off the pipe before the slower moving debris can get out. We use various pieces of specialized equipment in the pipe to aid this process. Additionally we use various closures to provide some level of protection from non-nuclear debris and radioactive gases should they occur. Over the years we have refined our test configurations to the point of having a high level of confidence in the success of each event. However, there are still tests when the nuclear debris is not completely contained in the cavity created by the explosive. There were far more of those incidents in the 1960s and early 1970s. The test you refer to occurred in 1986 and used a containment design that has performed satisfactorily on a number of prior events. In the 1986 event, the grout plug near the cavity apparently moved causing the mechanical closure systems to fail and subsequently allowing cavity gas and other debris into the experimental chambers. I want to emphasize that other mechanisms used to prevent gas escape from the tunnel performed as expected and there was no uncontrolled release of radioactivity to the atmosphere. At this point we have a fairly good understanding of what happened but not as good an understanding of why. Immediately after the event we convened a Containment Advisory Team to review the containment system design, the site geologic structure and materials property data, the as-built installations, and the previous experience. They made specific recommendations that we have implemented with success.

SMALL ICBM

Senator THURMOND. What role has the DNA test program had in demonstrating the survivability requirements for the Small ICBM program?

Dr. ATKINS. DNA has played a major role in demonstrating the survivability requirements for the Small ICBM. This includes defining the nuclear environments, developing nuclear effects simulators and test techniques, and determining the nuclear loads on and responses of the missile and its hardened mobile launcher. The

MK-21, which was developed for the Peacekeeper, but also carried by the Small ICBM, has been extensively tested in underground nuclear tests. In addition, electronics and missile materials have been demonstrated on these tests. The hardened mobile launcher has been subjected to a series of high explosives tests and shock tube tests to validate its survivability to air blast. To do this DNA developed a novel large yield simulation technique that accounted for nuclear fireball effects that were previously assumed to require atmospheric nuclear testing. DNA has also supported evaluation of alternative basing modes that were considered for the Small ICBM. Hard silos have been extensively investigated through high explosives nuclear cratering simulations and detailed exploration of the nuclear craters at the Pacific Proving Ground.

QUESTIONS SUBMITTED BY SENATOR SLADE GORTON

UNDERGROUND NUCLEAR TESTS

Senator GORTON. In your summary you state, "requirements are now emerging for a new class of underground nuclear tests to support future weapon systems requirements." Can you tell us what are these future weapon systems you are referring to?

Dr. ATKINS. Let me start with the cavity tests. The objective of these tests is to determine the effectiveness of our weapons against hardened targets. In the past we have depended on relatively low levels of blast and overpressure to destroy the targeted structures. These low pressure environments are relatively well understood and can be simulated in high explosive tests. The deeply buried and hardened structures now appearing in the Soviet Union are relatively insensitive to low levels of blast and overpressures. Cratering, ground shock and very high overpressures are the effects mechanisms that can hold these targets at risk. These effects are very dependent on the details of how a weapon couples energy into the ground. We have embarked on a series of cavity tests, using fairly low yields, to address the physics of the energy coupling process. There are convincing arguments that these low yield tests cannot realistically simulate the ground shock coupling of modern militarized weapons; therefore, if we must rely on cratering and ground shock to hold the deeply buried targets at risk, we will probably have to do a test of a militarized weapon [deleted].

Next I want to address the future radiation test requirements. We have become increasingly dependent on our sensing and communication assets in space. Future requirements indicate that these systems will be required to operate without interrupt through exposure to radiation environments. This is a very stringent requirement. Some testing of these systems will be required if we are to have reasonable confidence that the operate through requirement has been satisfied. The sheer size of these systems will require vacuum line of sight pipes much larger and longer than any we have used in the past and nuclear yields substantially higher than is typical today.

Finally, I want to discuss a new type of underground nuclear test to address source region EMP (SREMP). SREMP has been a concern for some time for systems that must operate on the tactical battlefield. We have looked at ways of simulating this environment but as yet have been unable to get the desired exposure level over the volume of interest. (We are concerned about effects on items such as tanks and mobile communication facilities). [Deleted.] Should we do this, it will be a substantially different test from any we have done in the past.

DNA SURVIVABILITY TEST

Senator GORTON. You state in your testimony that over the last two decades, the primary users of DNA survivability test have been the developers of strategic missile systems. Do you see less of a need for such DNA analysis after a START agreement is concluded? Or will we continue to require nuclear weapons effects testing as we modernize our strategic forces after START?

Dr. ATKINS. We will not only continue to require nuclear effects testing as we modernize our forces following a START agreement, such testing will assume even greater importance. Let me elaborate. Proliferation of systems is one means of increasing survivability and effectiveness. Substantial reductions in numbers of offensive systems will eliminate proliferation as a means of assuring the survivability and effectiveness of adequate forces to maintain deterrence. As the numbers of offensive systems are reduced, each remaining system will bear an increasingly larger share of the deterrent value against a target base that is not substantially reduced

in numbers and that is becoming harder with time. Therefore, each remaining system will have to be more survivable and more effective.

DEVELOPING HARDNESS SYSTEMS

Senator GORTON. You have rightly pointed out that developing hardened systems requires constant attention to detail and seasoned judgment of designers with years of experience in nuclear weapons effects. Given the brain drain that would occur once we ceased testing (because without nuclear testing, these scientists would pursue other lines of research), how long would it take us to resume normal testing should we decide such testing was necessary for reasons of national security?

Dr. ATKINS. My estimate is that it would take approximately 5 years to resume normal testing. Some would consider that estimate optimistic. You are quite correct that were testing to cease, the scientists currently involved in the program would find other challenging research. Our experience is that once these scientists leave one line of research for another, for whatever reason, they rarely return to their original endeavor. The potential loss of scientists is only one aspect of the problem. There is the entire infrastructure we have built up over many years to support our testing program. This infrastructure represents an investment of approximately \$20M per year for people and equipment. The people include engineers, electronic technicians and instrumentation technicians, as well as the craft labor such as electricians, pipe fitters and miners. While one can hire new engineers, technicians and craft labor, it would be impossible to quickly hire people with the depth and breadth of experience our people have today. Likewise, we have maintained support facilities as well as state-of-the-art instrumentation and recording facilities. The capabilities these people and facilities provide would rapidly degrade should there be a cessation in testing. The people would be gone within a year and in only a few years the support and equipment infrastructure would be degraded to the point of being useless. Therefore, my estimate of 5 years to resume normal testing assumes we can rebuild the infrastructure of people and equipment from the ground up while preparing a test that now requires 2 to 3 years for planning and execution.

[Whereupon, at 4:04 p.m., the subcommittee adjourned.]



**DEPARTMENT OF DEFENSE AUTHORIZATION
FOR APPROPRIATIONS FOR FISCAL YEARS
1990 AND 1991**

WEDNESDAY, MAY 10, 1989

**U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC FORCES
AND NUCLEAR DETERRENCE,
COMMITTEE ON ARMED SERVICES,
Washington, DC.**

**OPERATIONAL REQUIREMENTS OF THE STRATEGIC AIR
COMMAND**

The subcommittee met in executive session at 10:06 a.m. in room SR-222, Russell Senate Office Building, Senator J. James Exon (chairman of the subcommittee) presiding.

Committee members present: Senators Exon, Nunn, Levin, Glenn, Gore, Warner, Thurmond, and Cohen.

Professional staff members present: Robert E. Bayer, Robert G. Bell, William E. Hoehn, Jr., T. Kirk McConnell, and Michael J. McCord.

Minority staff members present: Patrick A. Tucker, minority staff director and counsel; Robert F. Bott, Brian D. Dailey, Ronald P. Kelly, and George W. Lauffer, professional staff members.

Staff assistants present: Tiffany E. Berger and Mickie Jan Wise.

Committee members' assistants present: Jeffrey B. Subko, assistant to Senator Exon; Kenneth N. Luongo, assistant to Senator Levin; William J. Lynn, assistant to Senator Kennedy; Milton D. Beach, assistant to Senator Glenn; Leon S. Fuerth, assistant to Senator Gore; James M. Bodner, assistant to Senator Cohen; Dudley Carlson, assistant to Senator Wilson; Anthony H. Cordesman, assistant to Senator McCain; Jack D. Crouch II, assistant to Senator Wallop; Robert M. Soofer, assistant to Senator Gorton; Charles Percy, assistant to Senator Lott.

OPENING STATEMENT OF J. JAMES EXON, CHAIRMAN

Senator EXON. The subcommittee will please come to order. While I am reading my opening statement I would like the staff to make certain the room is properly cleared. I ask staff to proceed in that fashion.

The committee meets this morning to receive testimony from Gen. John T. Chain, Jr., the Commander in Chief of the Strategic Air Command, on the current and future state of our strategic deterrent. General Chain has been an annual fixture on our calendar

of hearings and we are very pleased that he is here with us again this morning.

Two years ago, the committee returned to a previous tradition of holding an annual review of the status of the U.S. strategic nuclear deterrence under a variety of scenarios, assumptions, and measures of merit. These reviews are a reflection of the committee's interest in and emphasis on net assessments in all theaters.

These reviews are also intended to enlighten the members and the public on what kind of return the Nation has received for all the money invested in the strategic modernization.

As in past years, I have asked General Chain to present the results of hypothetical attacks by the Soviet Union on U.S. strategic nuclear forces, both for generated and day-to-day alert condition and measured in terms of surviving weapons and the target coverage of these retaliatory forces.

For the last 2 years General Chain has presented these assessments in terms of a base year's force—the current year, in other words—the end of the 5-year defense force, and for some remote future year. These comparisons are particularly useful, for they give us some perspective on how things change or remain consistent over time as forces are modernized or altered in composition.

Also, last year General Chain was able to provide us with data on force capabilities under a possible START Treaty, and I certainly hope we can examine that issue again today.

Finally, I hope he will comment on the relevance for our future force planning of the so-called "bolt-out-of-the-blue" attack. I feel that the "bolt-out-of-the-blue" attack is something that may not be generally understood by the public at large and maybe not even as much as it should be by the Congress as we plan for the best return on our dollars invested in nuclear deterrence.

In light of our improved warning indicators, many believe we should now begin to consider some less extreme case where strategic warning of impending attack is limited. But, of course, it will never be zero.

In the last several years we have learned of administration plans for a key strategic modernization program. First, the Midgetman will be pursued in tandem with the Rail Garrison MX, and the latter will be limited to a force of 50 missiles redeployed from their present silos. The B-2 bomber multi-year procurement has been deferred for at least 1 year and the Department of Defense appears to have settled on a get-well program for the B-1B.

The committee will explore these decisions and other issues in the question and answer period. In particular we will want to hear what General Chain's priorities are in these areas.

At this time I would like to recognize my great friend and colleague, Senator Thurmond, the ranking member of the Strategic Forces Subcommittee, for any opening remarks that he might have now before we turn to General Chain. I am pleased to recognize Senator Thurmond.

Senator THURMOND. Thank you very much, Mr. Chairman.

Mr. Chairman, I join you in welcoming Gen. Jack Chain back before the subcommittee in what has become an annual and eagerly anticipated appearance. I congratulate General Chain for the

fine job that he and the men and women under his command are doing in the service of our country.

Mr. Chairman, we find ourselves at an important junction in our strategic force posture. The strategic modernization program that was initiated in October 1981 has strengthened our deterrent posture, as we shall see in the General's analysis this morning.

The big uncertainty we face today is whether we will be able to complete the modernization program in the projected budget environment. It is not clear at this time whether we will be able to afford a two-mobile missile program or to complete the Stealth bomber program on the scale and pace now planned.

With the perception of peace breaking out around the world, a development which we should all applaud and which I attribute directly to the strength of the U.S. commitment to defense over the past 8 years, it may be difficult to secure a long-term commitment to these costly initiatives.

Despite the declared peaceful intentions of the Soviet Union, they have continued to modernize their own strategic forces at an unparalleled pace. Today they are deploying modern nuclear systems in each leg of their strategic triad. While we debate about mobile missiles, they have already deployed both a rail-mobile and a road-mobile system.

Mr. Gorbachev may talk about reducing defense expenditures and about reducing force levels, but that talk is not reflected in the unprecedented modernization activity that we see today in the Soviet strategic forces.

Mr. Chairman, this committee has already received the testimony of the Secretary of Defense and the Chairman of the Joint Chiefs of Staff on the amended budget request. We are all aware of how painful the cuts have been to reach agreed spending levels for fiscal year 1990. My concern, Mr. Chairman, is that fiscal year 1990 and fiscal year 1991 will not be the most stressing years on the resources available for strategic modernization.

I am particularly concerned about the combined 5-year funding implications of a two-missile program, a ramp-up in Stealth bomber production, the SDI program, and the requirements of the DOE weapons complex. While we might be tempted to deal with these programs 1 year at a time, I believe the responsible course is to take the longer-term view.

We need to put these programs on a course which is both affordable and predictable. I look forward to working with you and your staff, Mr. Chairman, to that end.

General Chain, I look forward to your presentation. It has always been a vehicle for thoughtful discussion of our strategic force posture accomplishments and priorities. I would also be interested in the views of the Strategic Air Command about the possible force structure that would result from the current START proposal.

Thank you, Mr. Chairman. I will have questions for General Chain at the appropriate time.

Senator EXON. Senator Thurmond, thank you very much. Let me add an amen and let me be a co-sponsor of what you have just said. You have summed up very well the concerns that you and I and others and both of us have discussed with General Chain in the past.

We are at a particularly critical time right now. In fact, this afternoon at 2 o'clock we are going to have a meeting of the full committee with regard to the budget proposals in not only this year but in the outyears, and there already has been a controversy break out as to whether or not the proposals that are being offered and those that have been tentatively agreed to begin to meet the budget constraints that we are going to be facing in the years ahead.

Can I be assured by staff that the room has been properly cleared?

Mr. HOEHN. Yes, sir.

Senator EXON. It has. With that, General Chain, let me welcome you once again. We accept your full statement for the record, without objection.

If you care to read that or just give us the highlights, we serve at your pleasure.

STATEMENT OF GEN. JOHN T. CHAIN, JR., USAF, COMMANDER IN CHIEF, STRATEGIC AIR COMMAND

General CHAIN. Thank you, Mr. Chairman, Senator Thurmond. Thank you both for the warm welcome. I am delighted to have this opportunity to be with you again to discuss some of the most important issues facing our country.

As the Commander in Chief, Strategic Air Command, and director of Joint Strategic Target Planning, I will present an assessment of the Nation's nuclear capability. I have submitted my formal statement for the record and I appreciate your accepting it in full. But I would like to summarize a few main points.

First, I would like to emphasize that deterrence remains the best policy to prevent conflict. Second, credible nuclear deterrence requires continuing strategic modernization. And, third, we will be pressured to neglect strategic modernization by fiscal constraints, changing Soviet rhetoric, and the sedative of a potential START agreement.

Fourth, relative reductions in capability are not free. They carry the price of increased risk. The hardest task is to determine how much risk is acceptable. We must be extremely careful when considering alterations to the strategic modernization program. Our Nation's security is too important for anything less.

We need to find solutions that guarantee our security in the future for our great Nation, and with your permission I have prepared a briefing on strategic capabilities both for the near term and in the future. Later I would like to discuss the effects of ICBM and bomber modernization and present my recommendations for maintaining a credible strategic deterrent posture.

I am prepared at this time to present the briefing.

[The prepared statement of General Chain follows:]

STATEMENT OF: JOHN T. CHAIN, JR.
COMMANDER IN CHIEF, STRATEGIC AIR COMMAND
AND DIRECTOR, STRATEGIC TARGET PLANNING

SUBJECT: CINCSAC STRATEGIC NET ASSESSMENT

MR. CHAIRMAN AND MEMBERS OF THE COMMITTEE:

I welcome this opportunity to discuss with you strategic issues which are vital to maintaining the peace we have all worked hard to preserve. As we begin the final year of this decade and look towards the next, we see opportunities and challenges facing our commitment to peace through strength. Nuclear deterrence has been the backbone of our country's defense, preserving the peace we enjoy. Since 1946, the Strategic Air Command (SAC) has been the foundation of that shield, providing a credible nuclear retaliatory force. As the Commander in Chief of SAC, I strive daily to ensure the readiness and combat capability of our nation's ICBM and bomber legs of the strategic nuclear Triad. In addition to the Triad, SAC provides a deterrent to conventional conflict by supporting theater commanders with its long-range heavy bomber force, aerial tankers and reconnaissance aircraft.

Additionally, as Director of Strategic Target Planning, I am responsible for developing the integrated operational plan for employing our nation's strategic nuclear forces and coordinating it with theater nuclear plans.

It is from these perspectives as commander and strategic planner that I share my thoughts on the issues and opportunities facing us.

DETERRENCE: FRAMEWORK FOR PEACE

Since World War II, deterrence, based upon highly capable nuclear forces, has been the cornerstone of our nation's military strategy. Our goal has been to deter--not fight--a war. To do that, we have fielded forces that have convinced the Soviets they could not launch a successful attack against the United States or our Allies. The result has been over 40 years of freedom from nuclear war. To preserve peace, we must continue to convince all potential adversaries a devastating response to any attack is certain. If deterrence fails, our objectives are to defeat the enemy's aggression and end the conflict on terms favorable to the United States and our allies at the earliest practical time.

The US strategy of deterrence has evolved in response to a better understanding of the Soviets and to a changing strategic balance. From the late 1940s through the 1950s, the US had overwhelmingly superior nuclear forces and relied on the doctrine of massive retaliation to deter any Soviet aggression against the US and our allies. As the Soviets gained a nuclear capability and expanded their conventional forces in the 1950s, many began to doubt the credibility of an all-or-nothing doctrine. Such questioning led to the realization that deterrent forces needed the flexibility to deal with aggression at any level of conflict.

In 1961, the US introduced the deterrent strategy of flexible response--a strategy which required the American military to possess a force structure capable of responding to a broad spectrum of possible conflicts such as a limited engagement or nuclear aggression. For a flexible response

strategy to be convincing, the enemy had to believe that we had the means and the will to defeat any level of aggression. As the concept matured in the early-60s, it became apparent that our nuclear forces were ill-suited for anything short of full-scale nuclear war. Additionally, the survivability of our bomber force was called into question, as the Soviet threat improved. Thus, the early- and mid-60s witnessed the addition of new Minuteman ICBMs and Polaris submarines to form a strategic Triad.

During this same period, the Soviets initiated a long-term, sustained drive for military superiority. By the mid-1970s, the Soviets were fielding an extensive array of modern offensive nuclear weapons which were increasingly accurate, hardened, and dispersed--including development of mobile ICBMs which promised sanctuary for a large portion of their missile force. The Soviet's aggressive development of strategic defenses produced an operational antiballistic missile (ABM) system around Moscow and a proliferation of radars, control centers, surface-to-air missile sites and fighter interceptors.

By the late-1970s, it was apparent that Soviet force developments were steadily eroding the nuclear balance between the superpowers, tilting it in favor of the USSR. Confronted with this evolving threat, the US reaffirmed its need for flexible and credible response options backed up by nuclear forces capable of responding at various levels of conflict. Thus we sought more selective, discriminating and controlled options in our prepositioned employment plans and greater ability to adaptively plan in a crisis situation. Furthermore, we began developing flexible strategic forces--

forces which could hold at risk those valued assets which are critical to Soviet warfighting potential.

DETERRENCE: THE CONTINUING CHALLENGE

Central to the concept of deterrence is the relationship between certainty and uncertainty. First, we must convince a potential adversary of the certainty and effectiveness of our response to his attack. Thus, deterrence is served by increasing the adversary's uncertainty of a successful attack. To do that the US needs forces that can deter from normal day-to-day conditions through the brink of nuclear war--yet which can fight effectively if deterrence fails and nuclear war ensues. To maintain deterrence on a daily basis, we need to complicate Soviet attack planning with a variety of systems on alert and deployed in several basing modes. As their attack planning is complicated, uncertainty in their ability to achieve their objectives increases. However, if there were a rapidly escalating crisis, a balanced mix of day-to-day forces that can generate and/or disperse rapidly to increase total force survivability would help create stability.

If deterrence fails, our Triad forces must be flexible enough for the National Command Authority (NCA) to respond effectively at whatever level of conflict the Soviets initiate. Once the Soviets have commenced nuclear operations, our force structure must provide the NCA with the capability for prompt, large-scale retaliatory response as well as highly discriminate attacks against the full range of Soviet targets. Our current deterrence is best served by a balanced, strategic nuclear Triad of bombers, ICBMs, and SLBMs which compounds the Soviets' attack problem, provides a variety of military options, and

safeguards against technological surprise.

The concept of flexible response entails a strong conventional force as well as a balanced, modernized Triad, because bolstered conventional capabilities make nuclear war less likely. To that end, we have a significant national asset in our manned bomber force. SAC's conventional B-52s provide a potent combat capability for theater commanders today and in the future by decreasing theater firepower shortfalls with a responsive maritime and land attack capability. Also, at the lower end of the spectrum of conflict, B-52s provide the NCA with the capability to attack targets anywhere in the world within hours and without the need for third-country basing. When timeliness, range and payload are considered, there are conventional missions which cannot be accomplished and areas of the world which cannot be reached without SAC bombers.

DETERRENCE: MEETING THE THREAT

In the early-1980s, we began a dual approach toward fielding the modernized strategic combat capability we needed to carry out the national guidance. First, we squeezed all the capability possible from existing systems through a series of sensible, cost-effective modifications. For example, we have more than doubled the Minuteman ICBMs potential to damage hardened Soviet targets, and reliability upgrades have extended their expected service life well into the next decade. Modification to our B-52s have improved their weapon delivery accuracy threefold and extended the life expectancy of the airframe. Non-cruise missile carrying B-52Gs are now dedicated solely to the conventional role. Some are being modified to carry the Air Force's

first conventional standoff, point target weapon, the HAVE NAP. Additionally, the KC-135R program provides 50 percent more mission capability than the original KC-135A. Finally, upgrades to our strategic reconnaissance force have increased our ability to provide our national authorities and military commanders critical intelligence information in peacetime as well as in war.

Modifying and upgrading existing equipment has increased our capabilities significantly, but still leaves us short of having the total combat capability we need. As we have modified and upgraded, the Soviets' have worked to lessen the impact of our forces through increased hardening, mobility, dispersement, and improved defenses. The reality is that upgrading alone will not redress the strategic imbalance; we must also continue to develop and field new systems. We now see the fruits from our strategic modernization program.

The Peacekeeper and B-1B are adding significant combat capability to the Triad right now. With 50 Peacekeeper missiles operationally deployed in Minuteman silos, a string of unparalleled successful test launches and the missile's phenomenal accuracy, there is no question of its major contribution to deterrence. The B-1B, although much maligned, is on alert today and ready to go to war. It is the world's most advanced bomber and can penetrate Soviet defenses and deliver its weapons with great accuracy.

In the area of strategic communications, we have brought on-line the ability to operate in an electro-

magnetic pulse (EMP) stressed environment with the Ground Wave Emergency Network (GWEN). The remainder of the program is progressing well, but it is essential that we complete the program--even in an era of constrained budgets and amidst the rhetoric of Glasnost and Perestroika.

While we frequently focus our attention on systems, we must remember that the men and women in uniform have always been our greatest defense against aggression. I have designated 1989 as "The Year of the SAC Warrior" to foster a warrior spirit, promote a sense of service and commitment, expand awareness of the warrior heritage and enhance SAC's warfighting capabilities.

DETERRENCE: PRESENT CONSIDERATIONS

Throughout this decade, SAC has needed and received substantial support from the Executive and Legislative Branches. All three legs of the strategic Triad are being modernized and we are well on the way to correcting the strategic imbalance. However, increasingly tight finances are leading to a new era of reduced spending. While choices will be difficult during budget deliberations, one needs to keep in mind key considerations such as risks to deterrence and costs of alternatives which provide similar capabilities.

In the political arena, I applaud the present Soviet leadership's efforts at Glasnost and Perestroika and am encouraged by the warming of US-USSR relations. But, I recall the 1970s when we were enthralled with the promise of detente and were blind to the Soviets' massive strategic buildup. Therefore, I urge that we not forget the past and base our decisions on their observed actions rather than rhetoric. Soviet forces today are formidable--ongoing

modernization is making them better. At current rates the Soviets will have completely modernized all three legs of their strategic offensive forces within about a ten-year period and will have completed aggressive strategic defense and space upgrades as well. Until Soviet actions coincide with words, the strategic nuclear threat will not decrease and, in fact, will continue to increase.

I would, also, caution against defense cuts based on the prospect of a nuclear arms agreement. For START to reduce the threat and increase stability, two conditions must be met. First, the US must maintain a balanced Triad. The Triad's combined characteristics have successfully deterred a nuclear attack. Arms control does not eliminate the Triad's validity. Secondly, strategic modernization must continue. Modernization of offensive forces is essential in a START environment which places no limitations on air defenses, anti-submarine warfare, hardening, burying or dispersal of assets, and conventional forces. Rather than negating the need for modernization, START would underscore the need to complete and sustain strategic modernization.

DETERRENCE: THE ROAD AHEAD

Fiscal reductions have forced us to limit our modernization efforts. This and other changing conditions have prompted the President to conduct an indepth review of our defense strategy. This will establish the Administration's goals for force modernization. My first priority for ICBMs is Peacekeeper. With or without arms control, we need Peacekeepers to hold the most important Soviet targets at risk. The Peacekeeper's accuracy, targeting flexibility, and prompt response are ideal for this task. Furthermore, the Peacekeeper mobile missile option adds to stability and

is essential for our land-based ballistic missile forces. To this end, I believe Peacekeeper Rail Garrison is militarily sound and cost effective. The Peacekeeper missiles deployed in Rail Garrison will give us all the operational advantages of Peacekeeper plus enhanced survivability.

My second priority in the strategic modernization of our ICBMs is the Small ICBM (SICBM). This highly mobile system will be extremely survivable, thus adding to deterrence by complicating Soviet planning. The SICBM's single warhead will allow us increased planning flexibility, variable basing options, and the capability to hold at risk a wide variety of targets separated by time and location. Given the fiscal environment, even though we need SICBM, I don't see how we can afford to field both the Peacekeeper and SICBM at the same time. To that end, I endorse the proposed sequence of deploying the Peacekeeper in Rail Garrison followed by deployment of the SICBM. This "in series" sequence provides mobility at the lowest cost, at the earliest operational date.

We have received all of our B-1B aircraft and the system is maturing. It is a highly capable, multi-role bomber that will be able to penetrate enemy airspace well into the 1990s, thanks to its high speed, low altitude flight, reduced radar cross-section and adaptive defensive avionics. The B-1B program has given us time to develop the B-2 at a prudent pace--a warplane that will keep us ahead of any adversary well into the next century.

While the B-1 can penetrate to strike most Soviet targets in the near term and many Soviet targets for years to come, only the B-2 provides the means to cover the most

critical, heavily defended targets in the longer term. The B-2 represents a keystone in the concept of leveraging US strength against Soviet weaknesses. The B-2's unique capabilities will increase our ability to hold at risk a wide range of Soviet offensive and force projection forces on an enduring basis. With its low observable characteristics, the B-2 will be able to survive in highly defended regions and attack difficult targets with an accuracy that would require a much larger number of less accurate or less survivable weapons systems.

The combination of the B-1 and the B-2 penetrating bombers present Soviet air defenses with a formidable problem. Because of the different performance regimes of each system, the Soviets will not be able to focus their considerable defensive system to deny mission execution. An attempt to do so would require further massive investment of their already strained resources.

I also want to emphasize the importance of continued support for the Minuteman and B-52. As I stated earlier, we have had great success in modifying both systems. Current and planned upgrades provide a great amount of capability for the dollar and deserve your continued support. I want to specifically address the cruise missile carrying B-52Gs. Retention of some in a standoff role is required to maintain target coverage and ensure a critical operational capability is maintained until the B-2 is fielded in sufficient numbers.

An essential link uniting our strategic forces is the ability to positively communicate with and control those forces prior to and during a nuclear exchange. Your con-

tinued support for modernization of nuclear command and control programs is absolutely critical. Specifically, the Groundwave Emergency Network, Miniature Receive Terminals for bombers, and missile launch control center Super High Frequency Receivers are vital to launch and execute our strategic forces. Our emphasis must be on execution survivability rather than immortality.

Deterrence of conventional conflict is also very important. To that end, I have dedicated the non-cruise missile carrying B-52Gs to the conventional mission. The airplanes are capable and constitute a "bought and paid for" national asset. SAC is fully committed to the conventional bomber mission. We are working hard to improve tactics, procedures, training, and warfighting capability in support of theater commander requirements.

I strongly support continuing the KC-135R conversion program--it is integral to the success of both our nuclear and conventional missions. Given the current and projected worldwide tanker shortfall, to do less would impose unacceptable limitations on theater commanders' operations.

Intelligence remains a major force multiplier. Initial efforts to increase readiness and combat capability have substantially increased SAC's ability to support any type of conflict. We require the ability to obtain, produce and disseminate vital information in minimal time while current capabilities require days or hours. Our required capabilities are planned to be interoperable with other Service and DOD systems, increasing the usefulness and cost-effectiveness of those intelligence assets. These capabilities are needed today for timely warning and to prosecute a war if

necessary. Additionally, they will be increasingly essential in a world of expanding arms control agreements.

Finally, we must remember that combat capability necessary to provide deterrence involves more than weapon systems. Highly capable forces with motivated, committed people are better than larger, hollow forces. Defense cuts must not be at the expense of readiness or "personnel support" programs. For example, flying hours are normally an inviting target, the impact of flying hour cuts on aircrew retention and readiness would be staggering--far more than mere training losses might suggest. In fact, we need to increase the flying hours our crews receive to ensure they are able to carry out their wartime tasks. Likewise, our people must feel the nation values their dedicated contribution to national defense. Unfortunately, I see a continuing erosion in people programs--from monetary compensation to retirement benefits. What's worse, this is not only reflected in the dissatisfaction being expressed by the troops themselves, but is being watched by those considering a service career.

It's hard to ignore the evidence. For example, since FY 83, six of seven military pay raises have been capped below the private-sector wage growth. Pay gap projections will create a 10.9% disparity--assuming the 3.6% FY90 pay raise is agreed to by Congress. Another example is that the housing allowance system, which consists of Variable Housing Allowance (VHA) and Basic Allowance for Quarters (BAQ) is not working as originally intended by Congress; median out of pocket expenses are now at 21.5% vice 15%. Sixty eight percent of Air Force VHA recipients experienced reduced FY 89 VHA compensation in

order to stay within Congressionally mandated VHA funding caps. There are widespread perceptions among military people that their medical benefits are in jeopardy. The proposed two-year test program introducing user fees abrogates the implied contract of free medical care, fuels perceptions of a reduced standard of living, and diminishes the sense of security. Declining Congressional support for MWR appropriated funds is punishing the rank and file. Finally, the retirement system--a major retention factor--has seen changes resulting in a 17% drop in lifetime value for a typical retiree.

Frankly, the declining compensation structure has led many of our people to lose faith in "the system" and has been a key factor in decisions to pursue other careers in the private sector. Erosion of the personnel support system will ultimately impact readiness and SAC's combat capability as seasoned expertise is lost. Years of experience essential to sustain the career force in the outyears cannot be replaced--it must be grown and nurtured. The time to restore our people's confidence is now--before we relive the history of the late 1970s.

SAC AND THE FUTURE

We need to keep our focus on certain fundamentals. First, deterrence remains the best strategy to prevent conflict. Secondly, a credible nuclear deterrent requires a balanced, capable Triad. Third, we can enhance conventional deterrence by leveraging our existing investments in B-52Gs to realize significant, low cost gains in conventional warfighting. Finally, we must reaffirm our commitment of providing an equitable standard of living for our

people. No matter how modern our front line systems become, they are hollow without dedicated, motivated, and experienced warriors. However, there are current trends which could distract us from these fundamentals.

As we strive for a balanced budget, we may be tempted to make false savings. Therefore, we must continue to ask "How much risk is acceptable?" and "What are the costs of alternatives to provide similar capabilities?" Also, warming international relations may tempt us to reduce military expenditures to very low levels. While we applaud the Soviets' rhetoric on reducing their enormous military power, we must also pay attention to Soviet actions. Finally, let us keep START in mind, remembering that arms reduction talks are not an alternative to modernization. Quite the contrary, START underscores the importance of fielding the most modern forces so that the forces which remain after an arms control agreement are fully capable of continuing to provide a strong deterrent that will prevent a nuclear war.

With continued Congressional support, I am confident the B-1B, B-2, Peacekeeper and D-5 will prove as successful in maintaining deterrence as the B-52, Minuteman and Poseidon have over the past two decades. The Strategic Air Command remains committed to providing our nation the forces we need to fulfill our first and most basic security task--detering nuclear war.

Senator EXON. Please proceed with the briefing, General.

General CHAIN. Thank you, sir.

As you know SAC is both a nuclear and conventional command. However, this morning I will focus on our nuclear capabilities.

WHAT I'LL TALK ABOUT

What's our task.

What the balance of forces is.

What their capabilities are.

What our capabilities are.

What's the impact of START.

So what.

These are the subjects that I want to talk about in the order listed.

WHAT'S OUR STRATEGIC TASK

Deter nuclear conflict.

If deterrence fails.

[Deleted.]

Prevent or neutralize efforts to intimidate or coerce the U.S. and its allies.

For any discussion on the subject of deterrence one has to start with what is the task that I am given as the Commander in Chief of the Strategic Air Command. The number one task is to deter nuclear conflict. I want to make sure that my Soviet counterparts, General Deneikin and General Maksimov, can never go to the Secretary General and say that they have found a way to attack the United States and get away with it.

But if deterrence should fail and the Soviets should launch a nuclear attack against the United States, my first task is, by guidance, to counter the ongoing attack. And there is only one weapons system I have to do that with, and that is the land-based ICBM because that is the quickest weapon that I can get to shoot back at what is shooting at us.

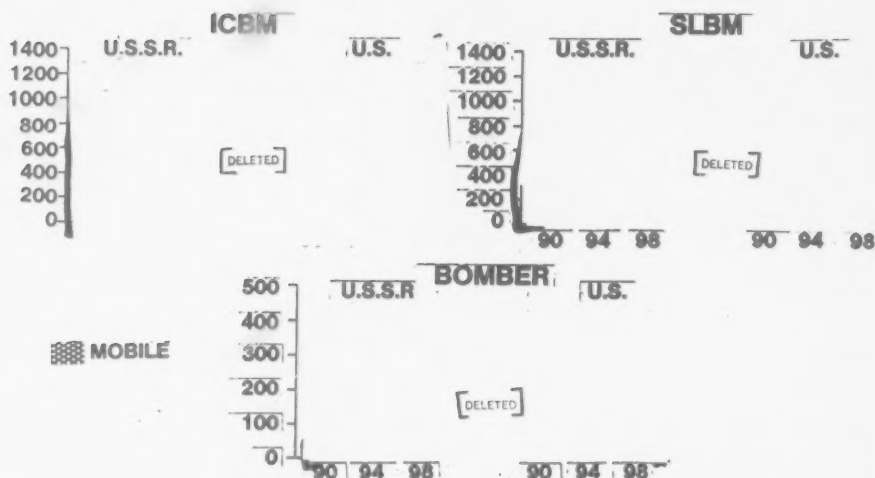
By so doing I hope to be able to limit the damage to the United States and to our allies, which is my second task, and then obviously see that the conflict is terminated on conditions that are satisfactory to the United States.

And during peacetime leading up to that we have to make sure that we do have the nuclear posture to prevent the Soviets from trying to coerce or intimidate ourselves or our allies.

So, what's the balance of strategic forces today and the next 10 years? (No START Treaty.)

So with that guidance I would like to now discuss the relative balance between the forces of the Soviet Union and the United States.

THE STRATEGIC BALANCE (NO START)



What we are going to look at now are some bar graphs which use the year 1990, which is what we are approaching, and then take a snapshot 4 years hence and then another snapshot 4 more years hence because later when we talk about START and its implications the first time that really shows up is in about the 1998 time frame.

I will draw your attention to the hash marks on each of these charts which will reflect mobile missiles. So you can see today the United States has no mobile ICBMs, while the Soviets have already deployed [deleted] trains carrying SS-24s and have fielded [deleted] battalions with three missiles each in a road-mobile system and as the years progress we see them continuing to go more mobile while we in the future will go mobile, starting in the 1994 time frame, hopefully with a Rail Garrison, and in the 1998 time frame we will have already fielded 50 Rail Garrison and started on the Small ICBM.

You can see a drawdown in the Soviet SLBM forces because their older boats like the Yankee and Golf class submarines are being removed from the fleet. The United States will have removed [deleted] aging Poseidon submarines from our inventory because of aging and have added [deleted] Trident submarines so you will see the perturbation between 1994 and 1998.

And in the bombers the Soviets continue to field the Blackjack bomber [deleted] and yet we see their factory production being able to be increased [deleted]. At the same time, they continue to field the Bear-H bomber, which is a cruise missile carrier, [deleted].

Meantime, we see a perturbation in the United States in that we are drawing down two bomber squadrons because of budget constraints. I am eliminating the FB-111 from the strategic forces and transferring that to the tactical forces, so we see a drawdown in

our bombers until the B-2 comes on line, and then we will go back up toward what will be a reasonable level in the bomber force.

FB-111

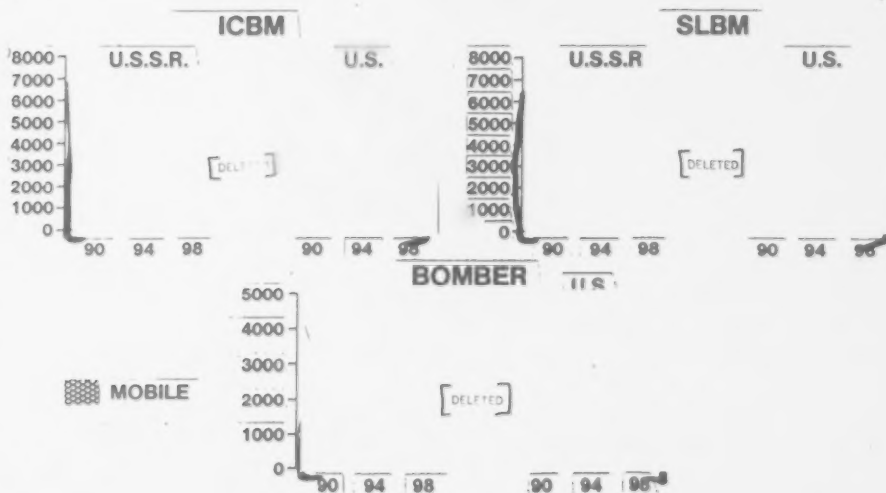
Senator EXON. General, could I interrupt there? The FB-111s which you are transferring to the tactical forces cannot carry on two missions simultaneously, but in case of adequate warning could we not use those to fill in and bring that 1994 short blue line up a little bit or not?

General CHAIN. No, sir. The tactical forces plan is to move those out to Clovis, New Mexico, at Cannon Air Force Base and basically put them in a training status. They could be generated and sent to Europe and be under the European Command, but they will not be accessible to the Strategic Air Command.

Senator EXON. For strategic bombing purposes?

General CHAIN. For strategic bombing, yes, sir.

THE STRATEGIC BALANCE GENERATED WARHEAD COMPARISON (NO START)



Now the warheads that go with those delivery vehicles are reflected on this chart. As you can see, in 1990 the Soviets, because of the SS-24 and SS-25, have mobile missiles and they will continue to build. Even though the strategic nuclear delivery vehicle in the ICBM will be reduced by 1998, the number of missiles they have will actually be higher than they have today because of continuing emphasis on deploying the SS-24, which, as you know, is a 10-warhead, MIRVed missile. So by 1994 they will still be in the 6,000 range as far as warheads are concerned.

In the meantime, we will be fairly static, with a little tiny increase here because we see 50 Small ICBMs in the projected buy for 1998, and then continuing to build out to the year 2000 until we

get the numbers that are agreed upon between the administration and the Congress of the United States.

For SLBM, these figures for warheads sort of match the same tracking program as with the submarine deployments—a perturbation with the Soviets and a perturbation with ourselves.

The good news is by 1998 we will have the D-5 missile on the Trident submarines, which will be a much better missile, more accurate than we have today.

In the bombers, reflecting what I talked about earlier with the Bear-H and the Blackjack, [deleted] and the United States' strong suit by the 1998 time frame will be that we will have over 4,500 nuclear weapons capable of being delivered by B-52s, B-1s and B-2s. The strength and importance of the Bomber force will be seen when we get to the START talks later.

Senator EXON. General, could I ask you a question while that chart is up there?

General CHAIN. Yes, sir.

Senator EXON. I assume that these charts you are showing us are based on the latest proposals sent to the Congress by the administration.

General CHAIN. Yes, sir.

Senator EXON. Reflecting the decision to proceed with the Small ICBM and a Rail Garrison and so forth and so on?

General CHAIN. Yes, sir.

Senator EXON. What would those blue figures look like under ICBMs there in 1994 and 1998 if we had proceeded as had been the Air Force's original position in the past to buy 50 more of the MXs?

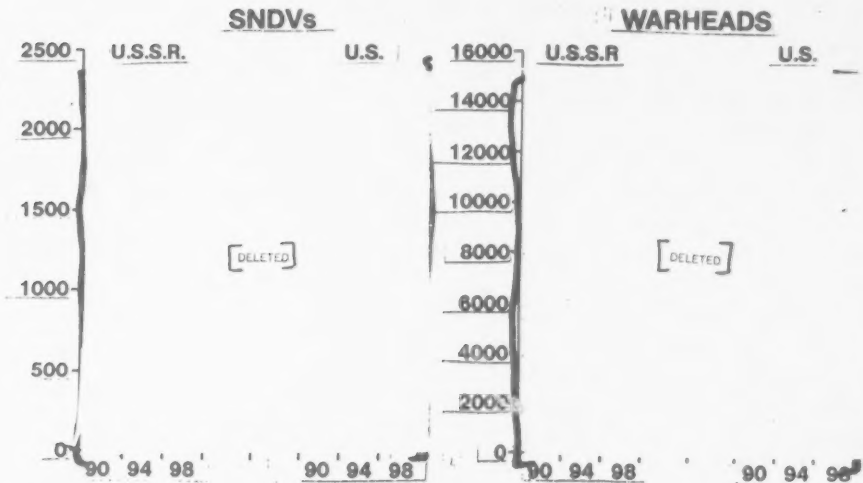
Can you tell me off the top of your head what would those 1994 and 1998 figures look like? Would they be significantly increased?

General CHAIN. The 1994 would be increased a little bit. The 1998, because we would be able to field both systems by then, so the 1994 would probably be about 300 more and by 1998 it would be 500 more. Because if we proceeded with the 50 additional Peacekeepers, the IOC ought to be in the 1992 time frame and the FOC should be approaching 1994. However, that would only be speculative since its not in the budget.

That is why I would push it out and say the full impact would not show up until 1988 because I would not know how the funding line would go.

Senator EXON. Thank you.

THE STRATEGIC BALANCE (NO START)



General CHAIN. In a macro, aggregate sense, then, how many strategic nuclear delivery vehicles, which are the ICBM, the SLBM, the bombers, in aggregate the Soviets have in this time frame. They come down a little bit, as does the United States, primarily because of the shifting to the more MIRVed missile in the ICBM and a shifting in the submarines. The same is true of the United States.

In the warheads, you can see the Soviets go from almost [deleted] up to [deleted] by 1994. The United States remains fairly constant and the perturbation primarily concerns the submarines.

Senator EXON. General, so we do not get into a number-counting game, do you have a follow-on chart? So many times we talk about numbers—bombers, delivery vehicles. In your opinion, does that chart that I see right there indicate what you believe to be the relative positions of the two, including the accuracy of the missiles and the confidence that you have in our systems and their systems?

Is that a numbers chart that would fairly reflect what you think would be the relative position of the two superpowers, given the technical advances of them or us on certain propositions—the command and control facilities? All this does not work unless everything fits together.

Maybe this is the question. Given what I think is our superiority in some areas, would those lines be basically level as far as our deterrent is concerned?

General CHAIN. You asked the best question possible, Senator. So let me answer it two ways. One, these are just chess pieces, so you can say that they are in relative balances. I would not trade our equipment with the Soviets' in any spectrum. And in a few minutes I am going to show you the damage expectancies if they attack us with this force and we attack them with our force.

Senator EXON. With these numbers?

General CHAIN. With these numbers. So it shows you quantitative and qualitative outcome.

Senator EXON. I am sorry I sort of got ahead of you.

General CHAIN. That was a perfect question because there is another point I would like to make, and that is I am convinced in my own mind, having been CINCSAC for about 3 years now that force structure deters.

So when I look at the Soviet Union in aggregate at their strategic forces and warhead count, and what we have against them, and knowing my counterparts do the same thing, I am convinced that there is no way that I could attack the Soviet Union today and get away with it. Equally I am convinced that there is no way they could attack us and get away with it.

Now if the numbers were down in this level (indicating), then all of a sudden every weapon starts counting significantly, and then perhaps the Soviet counterpart could say I think I could figure out a game plan to attack the United States and get away with it.

So at these relatively high numbers I am very comfortable that they cannot attack us, because force structure deters. It is only when the force structure shrinks to very low levels that I would be very concerned. That is why in a macro sense, I probably will be able to support START at the 6,000 number. But if it ever got much below that, I would have a major problem with it.

I know there are people saying we could deter with small numbers. I strongly disagree with that.

So, what are their capabilities with those forces?

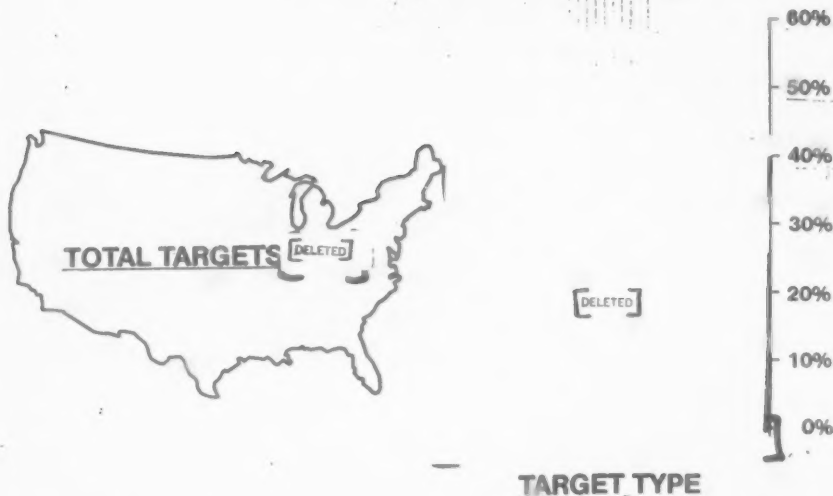
Senator THURMOND. General, what can you say about the relative quality and effectiveness of the warheads on that chart?

General CHAIN. It is a spread spectrum, sir. The quality of the Peacekeeper, the quality of the bombs that we have are good. The warheads themselves are good. The accuracy, however, depends on the age of the weapons systems. The Minuteman II, which is a single-warhead missile, [deleted] accuracy is [deleted]. The Minuteman III is about [deleted] and the [deleted].

So it is a spread spectrum as far as accuracy and the quality of the weapons that go with that.

Now I would like to apply those forces against the target bases.

GENERAL WAR TARGETS GENERATED NO START 1990



Senator EXON. General, let me ask one more question right here. I do not like to interrupt you, but I want to understand this. Maybe you are getting into that right now.

Sometimes I feel that we underplay the strength of our triad, which I think has been an extremely sound deterrent. I have some argument from time to time with those who say that one leg of the triad must not be a quarter of an inch shorter than another. I think that a requirement that all legs of the triad be equal is not realistic.

The strength of the triad is figured into the charts that you are going to give us now; is that correct?

General CHAIN. Yes, sir.

Senator EXON. And if we did not have the triad then we would not have the relative equivalency that you mentioned a few moments ago?

General CHAIN. In a macro sense, if I did not have ICBMs I would not have a prompt response capability. If I did not have submarines, I would not have a capability of day-to-day survivability at sea, which ends up being very beneficial in a reserve force. If I did not have the bomber, I would not have the capability to go in to see what we have and have not hit and be able to have follow-on attack to make sure the damn thing was dead, and which is a primary responsibility of the bombers.

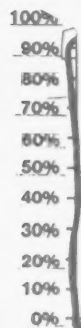
So each one has its strength. Each one has its limitations. If the Soviets were going to attack us—and we have a group of planners that each year spend their whole time looking at the target base inside the United States and applying the same type of criteria, if

the Soviets used our criteria what would they attack, they come up with a target base of [deleted] targets inside the United States.

About [deleted] percent of them are nuclear targets, meaning our ICBM silos, our submarine ports and our bomber bases, our leadership, meaning right here on Capitol Hill, meaning obviously over at the White House and the Pentagon, and those types of leadership. Other military targets would be Fort Hood, Fort Campbell, those types of bases and other ports. And then our economic base or our war-supporting industries would run up about another [deleted] percent.

So that is what my Soviet planner looks at and applies his [deleted] weapons against—these [deleted] targets.

**SOVIET DAMAGE TO U.S.
GENERATED FORCES
SOVIETS PREEMPT
NO START**



[DELETED]

— SOVIET GOALS

I will compare that in a few minutes against what we have to go against.

Now here is how if we apply their weapons and accuracies and probabilities of getting here, this is how they would come out today, in 1994 and also 1998. You can see against our nuclear forces today we think that they could destroy over [deleted] of what they would shoot at.

Now of course we do not think the ICBMs would still be in their silos. We do not think the subs would be in their bases and we do not think the bombers would be on the bases. But if they were, here is the relative attack success that they could achieve.

Senator EXON. Or, to put that in another way, what you are saying is that if there was a "bolt-out-of-the-blue" attack and if we had not done anything at all—in other words, if our forces were aligned as they are right at this minute—if all that came together that would be how effective their attack would be?

General CHAIN. That is right. If we did not respond, if we just sat there, here is the relative damage that the Soviets could inflict against us. The same in the leadership; they could get you and me, other military; and also the war-supporting industry.

Senator EXON. That says generated forces. Does this mean both sides are fully alerted but we would not do anything? Is that what you are saying?

General CHAIN. That is the measure because I am going to use the same type of analysis later showing what we can do against them from this posture. I reject that this would ever happen, but to have an apples to apples comparison I have to be able to show you.

SO, WHAT TYPE TARGETS WOULD WE ATTACK, AND WHAT ARE OUR RETALIATORY CAPABILITIES:

• IF WE EXPECTED AN ATTACK ON U.S.? (GENERATED CASE)

• IF WE WERE ATTACKED WITHOUT WARNING? (ALERT CASE)

So if the Soviets did launch an attack against the United States, what could we be expected to do in response, first from a generated case, which I think is the most probable and then from an alert case. And I will explain why I think the generated is the most probable in just a moment.

WHAT TYPE TARGETS WE ATTACK

[Deleted.]

Here are the type targets that I have been told to be able to hold at risk. The guidance comes from the White House to the Secretary of Defense to the JCS to me, and at each level it gets more detailed. I am told to be able to hold at risk these targets in the Soviet Union.

GENERAL WAR TARGETS GENERATED NO START 1990



We take the targets, a very large target list, and winnow it down until we get down to [deleted] weapons today that we need to be able to hold at risk with our weapons inside the Soviet Union against those target categories. You can see a large majority is in their [deleted].

WHAT OUR RETAILATORY CAPABILITIES ARE GENERATED CASE THE MOST LIKELY ATTACK SCENARIO

- GLOBAL CRISES INVOLVING CONVENTIONAL WAR WITH U.S. AND SOVIETS INVOLVED
- PROLONGED TENSIONS WITH FULLY GENERATED FORCES
- SOVIETS INITIATE ATTACK
- U.S. PROMPT RESPONSE

The reason I think the generated case is the most likely is I think that there is going to have to be something happening in the world before the Soviet Union is going to attack the United States with nuclear weapons. I do not think they are going to do that

today at 11 o'clock. It just does not make any practical sense. There is no reason for it to happen.

So something is going to have to be taking place. We assume that the Soviets would be the ones to initiate the attack and that the United States responds promptly. I cannot imagine the President of the United States telling me that he wants me to be able to stifle the ongoing attack if he is not willing to make that decision when the first bombs go off.

Senator EXON. But before that, General, if I understand correctly, you would of course have to have higher command authority from the President of the United States before you would launch an attack. [Deleted.]

General CHAIN. Yes.

MISSIONS INSTANTANEOUSLY

Senator EXON. On missions instantaneously. If you received information today that concerned you as the Strategic Commander in Chief, you do have the authority, do you not, to do many things, almost about everything save launching ICBMs; is that right?

General CHAIN. Yes, sir. There is a whole spread spectrum, from putting the crews out into the cockpits to taxiing the airplanes to the end of the runway, so I can pick up the phone right now and deploy—launch all the bombers and tankers that are on alert right this minute, if I thought the United States was going to come under a nuclear attack.

Senator EXON. You have the authority?

General CHAIN. I have that authority today.

Senator EXON. Just a little bit of history. How many times, if ever, has there been such a decision by the individual in your position in years before? Has that ever happened?

General CHAIN. Yes and no. The yes part is back in 1962 during the Cuban crisis the United States was flying bombers at that time with nuclear weapons on board in day-to-day alert status, and in 1962 I believe my predecessor at that time increased the airborne alert and increased the sizes of the forces that were on alert.

Senator EXON. Put more people in cockpits at the end of the runway? Is that what you are saying?

General CHAIN. That type of action. And then in 1973 during the Arab-Israeli crisis, although they did not launch the aircraft, they did go to a higher state of readiness.

STRATEGIC WARNING INDICATORS

Senator THURMOND. General, much has been said about the concern that political leaders might not heed strategic warning indicators for fear of further escalating a crisis situation. As an operational commander with two-thirds of the bomber forces at risk if non-alert forces are subjected to an attack, how do you respond to concerns about acting on strategic warning?

General CHAIN. I think that is a false target used by people who have the other motivation. I cannot imagine that we would ever elect in this country a President of the United States that would not act on strategic warning to increase the posture of his forces. Something would have to be going on.

Today, for instance, the Soviets have [deleted] nuclear submarines with missiles on board. [Deleted] of those submarines are in port; the others are at sea on alert, but [deleted] are in port. The Soviets have [deleted] SS-24 trains, [deleted] of which are in garrison. The Soviets have [deleted] SS-25 battalions, [deleted] of which today are in their garrison.

The Soviets have [deleted] bombers on alert. The Soviets have [deleted] tankers on alert. The Soviets have [deleted] boats, surface ships, at sea. [Deleted.]

Now from that alert posture, if the Soviets were going to attack the United States they would need to start generating those forces. With those indicators and warning I cannot believe that the President of the United States would not follow suit by generating. I have the authority to start generating the bombers myself, and I would start generating the bombers if I saw the Soviets starting to increase their alert posture, moving their trains out, moving the Small ICBMs out, sending the submarines to sea.

Senator EXON. That is an important point. You would have the authority——

General CHAIN. To generate the bombers.

ORDERING BOMBERS TO FLY

Senator EXON. To generate the bombers. You would have the authority at your discretion and your discretion only to send the Rail Garrison MX out and deploy them on the general railroad system?

General CHAIN. Since it does not exist that is a speculation, but if I can generate the bombers I would argue that CINCSAC should have that authority. I think the President of the United States would make that decision and probably use it as a political tool as tensions increased.

Senator EXON. But my question, General, is——

General CHAIN. It has not been established.

Senator EXON. It has not been established. Well, the point is, you are making a very good response and we will go ahead with the briefing. The point is that the President of the United States is quite frequently presented a scenario similar to the situation at Pearl Harbor. I believe the President of the United States at that particular time did not take the proper action given the strategic warning available. That is my estimation of the situation.

And in fact if the President of the United States ordered you not to alert bombers, not to send them off, then of course you would be bound by that, but we are not paralyzed under the system that we have now from the standpoint that we sit there and sleep, because we do have people like you that have authority to do certain things at your own discretion without even checking with higher authority; is that right?

General CHAIN. Exactly right, Senator, and you are going to see in just a moment that the people back in the Pearl Harbor days had nowhere close to the intelligence-gathering information that we have today.

ORDERING SUBMARINES TO SEA

Senator EXON. Can you order the submarines in port out to sea?

General CHAIN. I cannot, but the Navy commander can. In my JSTPS hat I come up with the targets that the submarines shoot at, but the Navy commanders in the Pacific and in the Atlantic control the day-to-day operations of those fleets. He is the authority to move those out to sea.

Senator EXON. My question is, if you should get a serious warning today on this thing of course you would check with the President and everybody else, but through the military command exclusive of the President they could order nuclear submarines out that are in port?

General CHAIN. Absolutely.

Senator WARNER. Mr. Chairman, would you yield for a statement on my behalf on the point you just raised?

Senator EXON. Yes.

Senator WARNER. That authority, I presume, is given by the President and indeed I expect it is in some respects confirmed by law such that you can take those steps you feel prudent as the commander to make your forces more survivable.

General CHAIN. Yes, sir.

Senator WARNER. The flip side of the coin is that we have always said in terms of our analysis on the "bolt-out-of-the-blue" and so forth we are going to have warning because we will recognize the Soviets commencing a generation of their forces. This all sort of fits together.

In the final decision as to the use or non-use of the weapons rests with the President, but there is a very important discretionary authority imposed with respect to the commanders to take steps to generate those forces, and that signal we can presume likewise is transmitted through their various systems of collection back to the Soviet Union.

So you could have a situation where a U.S. commander who is beginning to take unilateral actions to generate the forces, which signal could be misinterpreted on the other side and start the escalatory process without the President independently intervening and making a decision; is that possible?

General CHAIN. Yes and no. The yes part is I have the authority to start generating the bombers right now. I do not generate bombers in 10 minutes. It takes hours to get the first ones generated. It takes days to generate the whole fleet.

At the same time that that decision would be made I would be in consultations with the Chairman of the Joint Chiefs and the Secretary of Defense, who obviously would be in consultation with the White House, and it would be an iterative process. We do not have the capability just instantly to generate all bombers or instantly send all submarines to sea.

So the political process would certainly be working and before anything like that would take place the Soviets cannot instantly start generating their forces. So as they start generating and as the warning indicators start coming up, I would be on the phone back and forth to Washington and I am going to show you in just a moment, the numbers of things that they are going to have to generate.

Before you walked in, Senator Warner, I went through what the status of the Soviet forces are today and their alert posture, and it

would take weeks to months for them to generate to a position that they could attack the United States.

Senator WARNER. So, in conclusion, as a practical matter where you have the authority and you exercise that authority it would be part of a process by which you are consulting with your superiors.

General CHAIN. Exactly.

Senator WARNER. And theoretically if you were to exercise your authority they could overrule it in a matter of minutes?

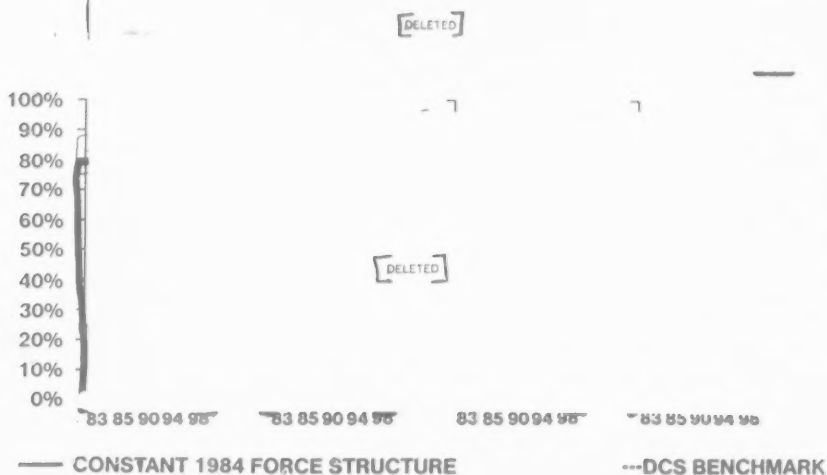
General CHAIN. Absolutely.

Senator WARNER. So the check and balance system is there?

General CHAIN. It is there, in being, yes, sir.

Senator EXON. Please proceed, General. We are sorry we interrupted you.

U.S. DAMAGE TO SOVIETS GENERATED FORCES PROMPT RESPONSE NO START



General CHAIN. No problem, sir.

Now if we use those forces here is the damage level we would be able to inflict against the Soviet Union. In this case I have gone back to 1983 because I want to make a point of our success through the strategic modernization program that has already taken place.

By 1990, because of the advent of the Peacekeeper missile, the B-1 bomber, and the ALCMs, you can see that our capability has risen significantly in these three major categories. And by 1998, with the continuation of the modernization program, which would include the SRAM-II, the D-5, the Trident submarines, the B-2, we continue to increase our capability. But that is against the evolving Soviet force.

Now if we had held our force to what we had in 1985 and had not modernized, I would be in here today telling you by 1998, because of their modernization, I could not as CINCSAC tell you I could continue to deter. So what people say what have we bought with the money, what we have bought with the money is every-

thing on these charts above this black line, and you should compliment yourselves on some wise decisions because there is the proof of what you have been able to do.

WHAT OUR RETALIATORY CAPABILITIES ARE ALERT CASE

THE MOST UNLIKELY SCENARIO

- NO GLOBAL CRISES
- NO PROLONGED TENSIONS
- SOVIETS WILLING TO BET THEIR COUNTRY'S
EXISTENCE ON NO, OR VERY LIMITED, U.S.-
RETALIATION

Now I want to shift and talk about the alert case, which I think is the most unlikely scenario for several reasons. First, there is nothing going on in the world. It is 10 May and at 12:00 the Soviets decide to attack the United States. There are no tensions and the Soviets are willing to bet their country that they can get away with such an attack.

WHY A BOLT-OUT-OF-THE-BLUE ATTACK IS MOST UNLIKELY

REQUIRES SOVIETS, WITHOUT U.S. DETECTION, TO:

- DISPERSE AND POSTURE THEIR:

[DELETED]

- LAUNCH WITHOUT DETECTION

[DELETED]

- VIEW U.S. RETALIATION WITH [DELETED] NUCLEAR WEAPONS
AS ACCEPTABLE

As I said, their leadership today is not dispersed. I watch that on a daily basis. Their mobile missiles, the SS-24s, [deleted] trains, [deleted] of which are in garrison today, SS-25, [deleted] battalions. All but [deleted] are in garrison today. Submarines. They have got [deleted] are in garrison today. Surface navy. [Deleted.] Armies. Some are out in the field on routine training, and the population has not been dispersed. [Deleted.]

And for them to attack the United States they are going to want to do most of these things to survive those forces. And they also think, to be able to launch the "bolt-out-of-the-blue," that they could launch sea-launched ballistic missiles and cruise missiles without detection.

ALTHOUGH UNLIKELY, U.S. MUST BE PREPARED

What we have done:

Intelligence and warning systems for Timely Force Posturing.

[Deleted.]

Over 10,000 personnel Air Force wide.

Over \$10 billion budgeted fiscal years 1990-1994.

Can provide advance indications of strategic attack preparations (can be days, weeks, or months in advance).

What we need:

A force structure which can continue to deter the most stressing threat, a bolt-out-of-the-blue attack, as well as all other threats.

And they have got to recognize that if they did that they are staring at [deleted] nuclear weapons that I have on alert today, and if anybody wants to try to attack the United States without generating in the Soviet Union, knowing they are going to get over [deleted] weapons back in their face, they will be shot by Gorbachev. There is no way that anybody is going to attack the United States "bolt-out-of-the-blue," no generation, and if they generate I have the capability of knowing that it is taking place.

Senator LEVIN. Are you going to give us that same number with the generated force?

General CHAIN. I can give you the number with a generated force. We would be up about over [deleted] if we generated our full force.

Senator LEVIN. You just showed a chart and said he would be shot because we have [deleted]. What would they do if they attacked us and we have [deleted]?

General CHAIN. For them to attack us I would argue that they would have to have generated their forces first.

Senator LEVIN. I know that, but you said because we have [deleted] we can lay back in their face in a "bolt-out-of-the-blue" attack, anyone who suggested that would be shot. And then I asked is there a chart which showed us how many we have that would survive an attack where our forces are generated. Your answer is over [deleted] that we could lay in their face.

General CHAIN. Yes.

Senator LEVIN. That is the most likely scenario?

General CHAIN. That is right. And that is why I think we will continue to deter. That is why I think we have been successful for these 40 years.

Senator LEVIN. My question is, would Gorbachev shoot the guy who suggested they attack us if we had [deleted] survivable war-heads?

General CHAIN. I think so, yes.

Senator LEVIN. Either way he would shoot the guy.

General CHAIN. The reason, to continue why I think we will have strategic warning, which seems to be a major issue, is you all have put in over [deleted] into our intelligence and warning systems in the last 10 years, and you have been asked in 1990-94 to put in another [deleted] which helps us with the strategic warning for these types of things.

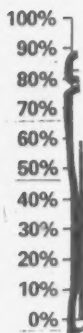
So I think we will, I am convinced that we would have an advance strategic warning. Even by being convinced we would have strategic warning, I need to have a force structure on alert, which we have today, that must be continued on alert so that we can preclude the "bolt-out-of-the-blue" attack.

U.S. DAMAGE TO SOVIETS

ALERT FORCES

PROMPT RESPONSE

NO START



[DELETED]

DCS BENCHMARK

Now with those weapons that I talked about in a comparison of how we would respond in a prompt response here is what we will be able to do in 1990 and then, the increases with the strategic modernization program, how we will be able to do in 1994 and 1998, and you can see in all cases our capability increases and thereby our deterrent capability also increases.

So, WHAT IF WE HAVE A START TREATY?

Senator THURMOND. General, could I ask you a question there? Does the Soviet target base change over the period shown?

General CHAIN. Yes, sir, it does. And I will show you the major changes that take place when we talk about the START Treaty. But the ICBMs silos do come down with or without START, as they go toward SS-24s, for instance, and as they go to more trains and

Small ICBMs and substitute SS-24, the MIRVed missiles, for some of their older missiles. The number of silos and launch control facilities decreases, for instance.

START ASSUMPTIONS

	<u>CURRENT POSITIONS</u>		<u>ASSUMPTIONS</u>
	<u>U.S.</u>	<u>SOVIETS</u>	
<u>SNDVs</u>	1600	1600	
<u>WARHEADS</u>	6000	6000	
<u>SUBLIMITS:</u>			
<u>BALLISTIC MISSILE</u>	4900	4900	
<u>WARHEADS</u>			
<u>HEAVY ICBM</u>	1540	1540	[DELETED]
<u>WARHEADS</u>			
<u>MOBILITY</u>	<u>BANNED</u>	<u>ALLOWED</u>	
	<u>UNLESS</u>		
	<u>VERIFIABLE</u>		
<u>COUNTING:</u>			
<u>HEAVY BOMBER</u>	1 WPN//	1 WPN//	
<u>NON-CMC</u>	<u>AIRCRAFT</u>	<u>AIRCRAFT</u>	
<u>ALCM</u>			[DELETED]

So, shifting now to a START Treaty—and I like to use, obviously, since it does not exist, what the relative proposals are in a macro sense on both sides—SNDVs at 1,600, total warheads at 6,000, the combination of ballistic missiles and SLBMs at 4,900, heavies, which we have none of, at 1,540, which would be the Soviet SS-18.

[Deleted.] So in my analysis I am going to allow.

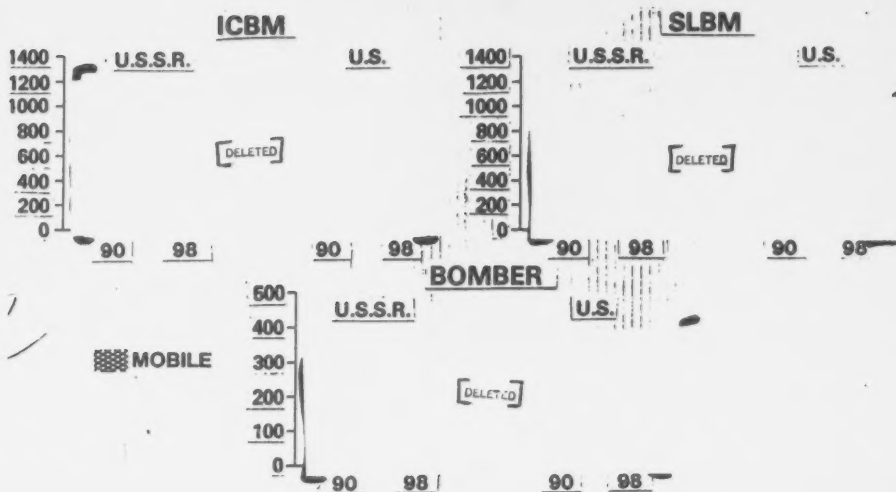
[Deleted.] And for the analysis we are saying we are going to use the attributed because we do not know how that is coming out. So we went with the U.S. position.

GENERAL WAR TARGETS GENERATED START 1998



The target base [deleted] targets in a post-START environment, most of which come out of the nuclear forces. The nuclear forces [deleted]. Leadership [deleted]. Other military changes just a small relative number, and the same with the economic. So most of the changes take place in nuclear in the target base in a post-START environment.

THE STRATEGIC BALANCE PRE/POST START

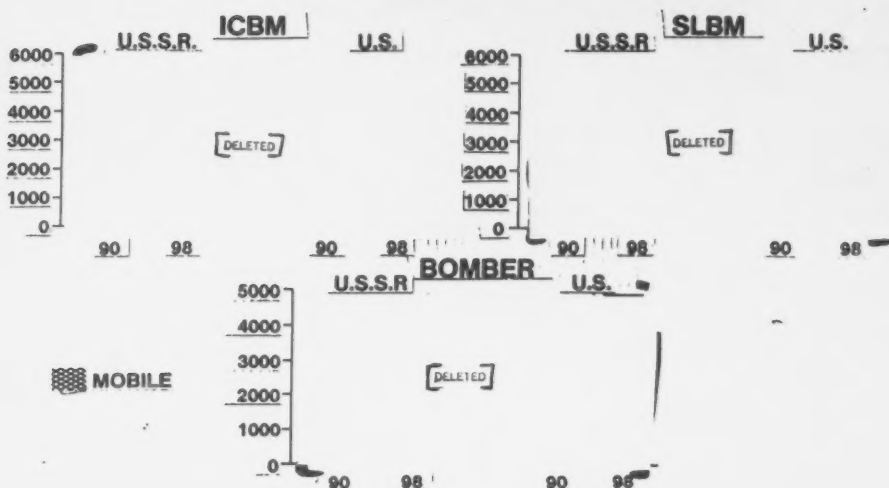


Here is where the Soviets are today, in 1990 and in the post-START environment, where they would be in 1998. Applying the macro rules of START, as you can see they have to come down in the ICBM, most of which will end up being in mobile systems—SS-24s on trains, SS-25s being road-mobile—and the remainder in silos. It would be a combination of SS-24s in silos and SS-18/Mod 5s in silos.

The United States will have to come down and by 1998 you can see 50 being in Rail Garrison, and by 1998, with an IOC of the Small ICBM in 1997, 50 would be included in this and that number would obviously change if you project it out further, so more and more as we ended up with the 500 Small ICBMs.

SLBMs. The Soviets would have to come down, as would we. And in the bombers they would come up a little bit and ours by 1998, as reflected on the previous charts, would also come up just a little bit with the B-2 coming in the inventory.

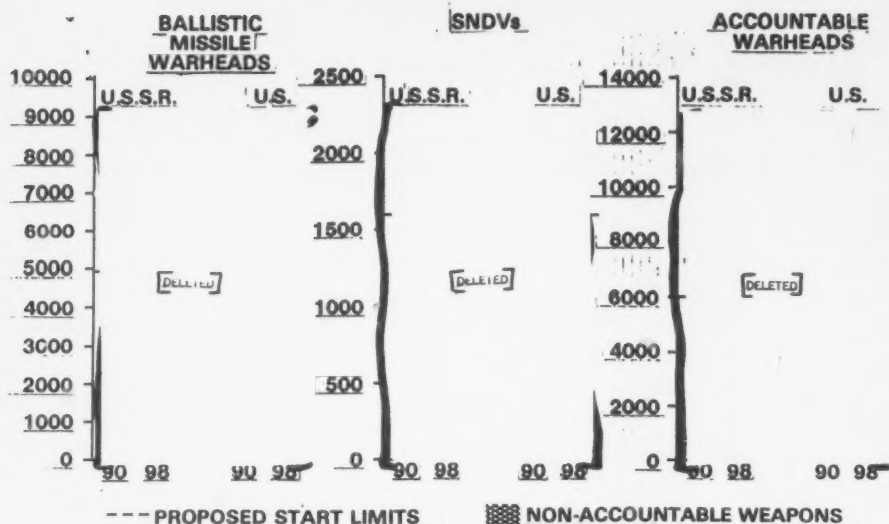
THE STRATEGIC BALANCE GENERATED WARHEAD COMPARISON PRE/POST START



Now as far as warheads are concerned, because of the MIRVed systems—the SS-18s and SS-24s—you can see some of their warheads are mobile, but not all. So there is a disproportionate share because of the Small ICBM of the systems that they have mobile, but this is the warheads. And the United States also would have increased the mobile warheads that we would have available to us.

And the same comments I made before. The submarine ballistic missile warheads correspond to the other drawdown, and the warheads on the bombers increase for the Soviets as well as ourselves. But our long suit in post-START, which you will see on a future chart, is that we will be able to have the START pushing [deleted] weapons associated with bombers in a post-START environment for reasons that I will explain.

THE STRATEGIC BALANCE PRE/POST START



Here is where we both are at 1990 and I will show you where we will be in 1998, again, against this 4,900 limit.

And for reasons of MIRVing both of us will end up being below the 4,900 in the warheads.

The strategic nuclear delivery vehicles. We have jagged edge here because there is no way for me to know how the Soviets really would posture their force in a post-START environment, so this is a best guess, that again because of the MIRVing they would end up having less than the 1,600 that they would be allowed. And the same thing is true with the United States, because [deleted].

Consequently, the United States, [deleted] to deter attack on the United States.

So the strength of the manned bombers, which I am sure we will talk about later, is critically important for us to be able to agree with START, because I need those weapons to be able to carry out the task that has been assigned to me. So that is very important and that is why I have to have a penetrating B-1, because if I hang ALCMs on the B-1 that does not do me any good, and if I do not have a B-2 then this does not do me any good.

I will not have enough weapons to be able to do the task that I have been assigned to do.

AVAILABLE WARHEADS

Senator GLENN. General, how many warheads would you have available to you before you ever started sending manned bombers to Moscow? Could we go back one chart there?

Senator EXON. What is the question, Senator Glenn?

Senator GLENN. The question is number of warheads. The General is talking about the necessity for the manned bomber out here

on the right adding to this. My question was how many will we have probably exchanged already before the manned bomber is ordered in, or would we have SLBMs and ICBMs going?

We are going to send the bombers in all at the same time?

General CHAIN. The SLBMs and the ICBMs, sir, will have already gotten there. ICBMs get there in about the 30-minute time frame. The SLBM gets there at about an hour. And then the lay-down is slower and the bomber starts showing up about the 7-hour point.

Senator GLENN. So over here we would have had, what, somewhere over [deleted] warheads available to us before the bombers started arriving?

General CHAIN. No, because that is a START environment, sir. So in the START environment we will be down at about 5,800—less than that. The warheads, 4,900 would be the aggregate, and since we are down below that we are probably talking about 4,300–4,400 warheads before the bombers show up.

MANNED BOMBERS

Senator GLENN. And we think at that time we still would need to go in with a manned bomber?

General CHAIN. Absolutely. There is absolutely no doubt in my mind. I can go back and show you the number. If every one of these arrived and every one was absolutely successful, [deleted].

But the probability of arrival is not 100 percent for all SLBMs and all ICBMs.

Senator GLENN. I do not want to delay, but I have supported the B-1 and supported the B-2 firmly, but not on the basis of what the Pentagon usually presents it on and what you are presenting here this morning.

I think the likelihood of us sending people in after we have got thousands and thousands of ICBMs going off all over the place, I think the likelihood we would be using that to go in at that point is questionable to say the least.

What I have supported it for is the fact that if we start another war it is probably going to be a conventional war starting out and we need a heavy bomber for that, hoping we never cross this nuclear threshold. I just get so disgusted because it is a rare, rare briefing that anybody on one of these things ever mentions the conventional capability, and it was only because some of us pushed like the devil to get the conventional capability tested in the B-1 early on that the Air Force even got going on the testing.

And then they went and were going to do conventional testing and every mission out there does a laydown and all that. But it took a lot of pushing to get that.

And without that conventional capability, which never gets mentioned in any of these things at all—I know you are mainly on the nuclear thing here now—but I have always thought you made a very special point of saying the B-1 and B-2 you need to perform the capability and that is one that has always been a question mark in my mind and a lot of other people around here as to whether a nuclear exchange with all sorts of stuff going off all over the world and EMP and everything just going off and the whole

world is going to hell we are going to start sending people in manned bombers in addition to all of the thousands and thousands of warheads going back and forth, and SLBMs, ICBMs, everything we have got going at that time.

So it is more a comment than a question, I guess. Anyway, you might address that later on.

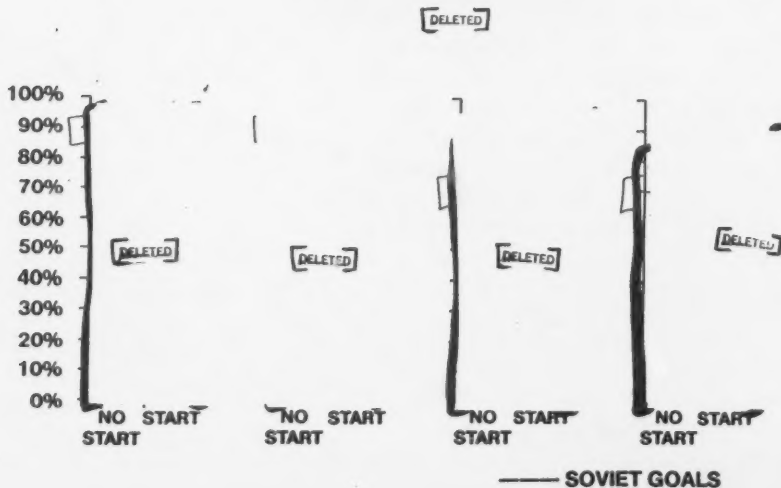
General CHAIN. I have to make a couple of comments. Could I have the very first chart, the SAC cover sheet?

When I started this briefing, Senator, I said the fact is I am a nuclear command conventional command. I will be happy to come back and talk conventional any time you want, because you are talking to Mr. Conventional when you are talking to Jack Chain, but I am talking about nuclear today, so that is what I am focusing my remarks on.

As far as the B-1 and the B-2 in the nuclear role, again I will go back to the previous charts in any detail that you would like, sir. But I need the number of weapons that I have available to me to be able to carry out my task that I have been assigned, and it is not that thousands are going off on each side.

I have got a target base that I am supposed to go against. I do not have enough weapons with SLBMs and ICBMs to cover that target base. The manned bomber will penetrate and there are a lot of targets that the only thing that can attack those targets is the manned bomber because we do not know where the hell they are, in addition to being able to go in and see whether a target has or has not been hit and then be able to put a weapon down on it, whether the ICBM did or did not arrive as we had programmed. So that is a fundamental disagreement with your position.

SOVIET DAMAGE TO U.S. GENERATED FORCES SOVIET PREEMPT NO START vs START 1998



Here is the Soviet, and again I refer back to what I had earlier. Here would be the Soviet damage to the United States with their

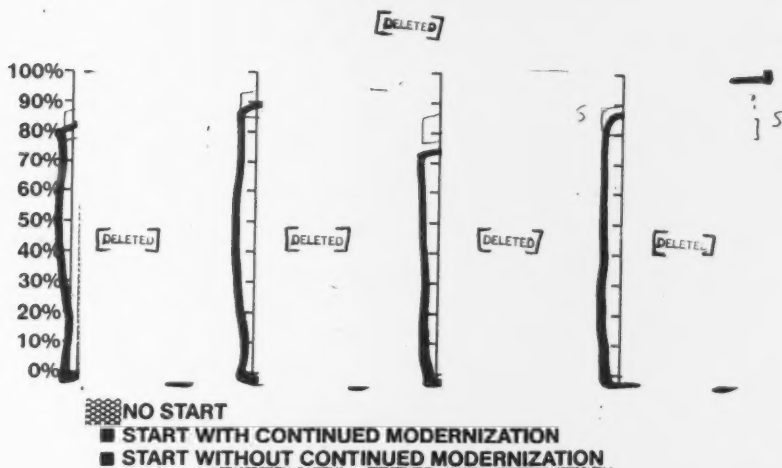
buttons available to them in a post-START environment. The columns on the left are what I talked to you about earlier. The columns on the right are what would happen in the post-START.

Again, the target base that they have to go against is significantly less, with [deleted] targets, where I have over [deleted] targets to hold at risk.

U.S. DAMAGE TO SOVIETS

GENERATED CASE
PROMPT RESPONSE
NO START — START

1998

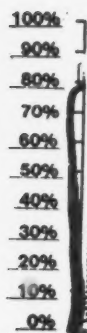


Generated forces, the most probable prompt response, the President making the decision to have the nuclear weapons start going off, again in a no-START and START environment.

In a no-START environment in 1998 here on the left in the hatches is what I told you we would be able to do. If we do not have continuing modernization, what I will be able to do or my successors would be in the blue. With continuing modernization, that is what modernization buys. In other words, we would have the same type of capability with modernization that we have today.

I was asked the other day by a member of the North Atlantic Council would we support a START agreement without modernization. The answer is no, and I think all the members of the Joint Chiefs of Staff will tell you the same thing.

**U.S. DAMAGE TO SOVIETS
ALERT CASE
PROMPT RESPONSE
NO START - START
1998**



- ☐ NO START
☐ START WITH CONTINUED MODERNIZATION
☐ START WITHOUT CONTINUED MODERNIZATION

The alert forces, the same type of chart where we would be without START, where we would be with START, and what modernization buys.

Senator EXON. But again modernization is the key.
General CHAIN. Yes, sir.

START SUMMARY

- MISSION UNCHANGED BY START AGREEMENT
 - TARGET BASE ~~DELETED~~ LESS BUT HARDER TO HIT
 - BETTER WEAPONS BUT FEWER OF THEM
- START DEMANDS
 - STRATEGIC MODERNIZATION
 - TRIAD REMAINS IN RELATIVE BALANCE
 - COMPLIANCE BY SOVIETS
- ANY PROPOSED START AGREEMENT WILL REQUIRE CAREFUL SCRUTINY

So in summary the target base in START would [deleted]. More mobile targets would be involved in that. And as far as my perspective is concerned modernization is the key. Again, the point that you raise, Senator Exxon, the triad is very important to us. Compliance on their side and our ability to be able to ensure compliance is critically important.

WHAT'S THE BOTTOM LINE

Again, we do not know what the final START agreement would be.

FORCE STRUCTURE DETERS

● THE NATION'S STRATEGIC MODERNIZATION PROGRAM

- WAS AND IS NEEDED
- WELL CONCEIVED
- IS PROGRESSING WELL
- IS MORE NECESSARY POST-START THAN PRE-START

● YOU CAN TAKE PRIDE IN ITS SUCCESS TO DATE

● IT REQUIRES YOUR CONTINUED SUPPORT

I feel very strongly about this. I am not delighted to say we have a draw in Korea because lots of fine people fought there, but I think history will say we did. I grew up thinking that we had a loss in Vietnam, because I spent 2 years over there, but I think history will tell us that we did and what the country can never afford to do is to end up with an adversary which even thinks they could attack the United States with nuclear weapons and get away with it.

It is just inconceivable. So as we address nuclear forces and nuclear posture I think that the strategic systems have to have special attention applied to them.

Sir, that concludes my briefing.

Senator EXON. General, thank you very much.

I would like to ask staff, so we can move around the table, to limit each Senator to 5 minutes, starting with me.

SMALL ICBM

General Chain, this year you have identified, as I understand it, the Small ICBM as the second-highest priority, trailing only the Rail Garrison MX and ahead of such important systems as the B-2 and others. Was that your ranking of priorities last year when you appeared before the committee? If there has been a change from last year, why and what accounts for the significant rise in the priority of the Small ICBM?

To soften the question a little bit, if there is an official position that you back and a personal position that you have, you would be free if you want to to so state.

General CHAIN. Well, first of all, Senator, I support the administration's position which, even though I am on the west side of the Mississippi River, I understand was worked out by leading Members of Capitol Hill. I think it was a good compromise and I support it—50 missiles coming out of Minuteman silos and being put on Rail Garrison, followed sequentially by a Small ICBM.

Last year I testified that I would like a second 50 Peacekeepers on Rail Garrison because I thought and still think that that would be the proper way to posture our forces. And for the last 2 years I supported the Small ICBM and the only reason that it was not in the budget for the last 2 years is because of financial constraints. I supported that position.

I am pleased with what appears to be a political compromise here in Washington, and I hope that it will get support. If it was a perfect world I would ask for an additional 50 Peacekeepers on Rail Garrison, and I would ask for full deployment of 500 Small ICBMs. But we are in a financially-constrained world and I think the compromise makes sense.

POTENTIAL THREATS

Senator EXON. Thank you, General. Could you provide a brief assessment of the potential threats to early warning C3 and bomber forces by short-time-of-flight SLBMs and SLBMs exploiting EMP effects launched from the polar region? How realistic are these threats today, in your view?

General CHAIN. Fortunately the Soviets have diminished the number Yankee submarines that they have, and the Yankee submarine had a missile that had a flight time, the shortest flight time, of about [deleted] minutes. They seem to be replacing them with Delta-4s, and the [deleted].

So we actually are getting more warning time out of more current Soviet systems than we had with the older system. So the Yankees were more of a threat to the United States than are the newer systems.

EMP does worry us. That is why the GWEN system is so important that we are being able to successfully field throughout the country except through the northeast, and hopefully some hearings that are taking place up there will break that logjam. But we already have a limited operational capability with GWEN.

My command post at SAC has been redone, where I now have a command post that is EMP-hardened. And I have great confidence in a pre- and trans-SIOP world, in this world, when nuclear weapons start going off, that I will have satisfactory connectivity with my bombers, my tankers, and with the ICBM force.

TACTICAL WARNING

Senator EXON. General, I want to get into tactical warning a little bit as far as your assessment of how that would affect our air-breathing leg of the triad. Despite the north warning and the OTHB radar upgrade, some argue that our tactical warning and

attack assessment capability against current and advanced air-breathing threat is inadequate and that we may run the risk of vulnerability to a surprise attack against vital command and control centers.

Could you comment on these concerns and how you view it?

General CHAIN. General Russ, who has responsibility, and General Piotrowski from NORAD would probably have a more in-depth answer for you, sir. But having talked with them they do not share that same belief.

They think that they do have satisfactory systems to be able to warn against a bomber attack. First of all, the bombers who are going to attack would have to be loaded out. We watch the bomber bases every day—day, night and through the weather, I might add—so we would know when the bombers are being generated, and at such time I would assume that NORAD, with its American fighters and Canadian fighters and the AWACs and the ground-based radars would start increasing their surveillance of the potential.

So I do not share the concern, but I think General Piotrowski would be the one to go into detail, sir.

Senator EXON. Thank you, General. My time is up.

I believe you would be next, Senator Cohen.

GENERAL WAR TARGETS

Senator COHEN. General, last year on the chart which provided general war targets generated in 1989 you had a total number of targets of [Deleted.] This year you have got [deleted]. What accounts for the difference? Is it the INF Treaty?

General CHAIN. No, sir. It is not the INF Treaty. We work very hard, Senator, to review the target base. We have a very large target list that actually goes up to over 100,000 targets, and we have a whole staff that spends the whole year trying to winnow that down and get it down to what do we really have to be able to hold at risk.

Fortunately, by eliminating some redundancy—I will use the example of nuclear power distribution in the Soviet Union—by being able to attack nodes that other lines would go through we have been able to reduce the target list.

Included in that also are some old ICBM silos which the Soviets, by complying with previous agreements, as you know, are destroying the headworks.

NUCLEAR WEAPONS

Senator COHEN. In November 1981 President Reagan issued NSDDD Directive 13 which sets forth several key elements of his policy on nuclear weapons, and among them are the following.

Deterrence must be maintained under any contingency, even retaliating to a strike without warning. U.S. policy remains not solely to rely upon launch on warning, and U.S. programs will be designed to achieve greater survivability. Are those elements still operative?

General CHAIN. Yes, sir.

PROMPT LAUNCH

Senator COHEN. Could you describe for me what prompt launch means as opposed to launch on warning, launch under attack? What does prompt launch mean?

General CHAIN. That is the mind of the President of the United States. We do not plan or assume that we will launch on warning. When I say "we", I am talking about the uniformed services. What the President decide obviously has to be his business.

We assume that nuclear weapons will have gone off before the President makes that final decision, which would be a launch under attack or on attack. But what I would not like to see—now in a closed hearing like this, this is fine, but what I would not like to see is the United States making any declaratory statement about what the President would or not do in different scenarios.

Senator COHEN. And I agree with that. I was just trying to get some kind of an assessment of what "prompt launch" means. But as I understand what you are saying, it means, prompt launch means after some of the nuclear weapons have struck, going off on our soil?

General CHAIN. On our soil or high altitude burst—whatever cross point the President would make that decision.

Senator COHEN. So does it mean whatever the President says it means? In other words, prompt launch could mean shortly after the Soviets have fired their weapons before they have arrived?

General CHAIN. Obviously, as he is my Commander in Chief, I am ready to respond when he gives me the order. I cannot second-guess what the President will do. I would doubt that the President would make such a decision on the basis of just our sensors.

Senator COHEN. [Deleted.]

I assume that assessment is still accurate, perhaps even more so now?

General CHAIN. Yes.

Senator COHEN. We are only looking at 50 MXs and it is even more so, correct?

General CHAIN. Yes, sir.

Senator COHEN. Is the primary reason for the heavy reliance upon prompt launch the vulnerability of the ICBM command and control or is it because of the need to attain your targeting objectives?

General CHAIN. To attain the targeting objectives. As I said in the beginning, the task that I have been given, starting with the White House and going through the Secretary of Defense and the Joint Chiefs of Staff, is to deter an attack on the United States.

But if deterrence fails my first step is to counter the ongoing attack. The only weapon that I have to counter the ongoing attack is the ICBM, because that is the quickest response that gets there, and they get there in about 30 minutes. So I can shoot at Soviet silos that are in the process of shooting at us.

As we walk through the different scenarios and read the different publications—classified—that we get from the CIA [deleted] and I want to be able, because I have tasked to, to stop the ongoing attack, and I want to be able to shoot at the things that are shooting at us.

NEED FOR B-2

Senator COHEN. One final question. You talked about the need for the B-2. Could some of the damage capability of the B-2 be reduced if a START Treaty were to ban the mobile MIRVed ICBMs of the Soviets? In other words, is there a reduction in the need for the B-2 if you have a banning of the mobile MIRVed ICBMs?

General CHAIN. I need a penetrating bomber. I need a number of penetrating bombers. The penetrating bomber is very good against mobile systems, but that is not the only systems that they go after. Today I can penetrate with the B-52s and the B-1s. Tomorrow, meaning the mid-1990s, I am going to have to take the penetrating B-52 out because of the increased Soviet defenses.

I need a manned bomber to be able to hold at risk mobile systems, but I also need to be able to hold at risk targets that we are supposed to have struck that the ICBM or the SLBM has not gotten there. And I do not want to waste another shoot at it. The bomber has to be able to go in to identify, yes, it has been struck so I will not shoot it or no, it has not been struck and therefore I will target it.

So a penetrating bomber is very valuable to us today and even more valuable in a post-START environment because of the Ahkramahov counting rule.

Senator COHEN. My time is up.

Senator EXON. Thank you, Senator Cohen.

Under the early bird rule, Senator Levin, you would be next. Do you want to ask questions now or shall I go to Senator Glenn?

Senator LEVIN. If I could just ask a couple of questions, thank you, Mr. Chairman.

Let me just go back to that one chart you and I talked about before where you said it would be absolutely crazy for a Soviet attack on us in a "bolt-out-of-the-blue" scenario because we would have [deleted] number of warheads that we could respond with.

I just want to pursue that one question with you for a minute. Would you be able to get that chart on for us?

Senator LEVIN. [Deleted] yes. Your argument here is "bolt-out-of-the-blue attack" is the most unlikely, and one of the reasons given is that there would be [deleted] nuclear weapons that could respond to that attack.

General CHAIN. Yes.

Senator LEVIN. You have another chart which says that an attack against us where our forces are generated would be the most likely.

General CHAIN. Yes.

Senator LEVIN. In that situation you indicated we would have about [deleted] nuclear weapons which we could retaliate with; is that correct?

General CHAIN. That is right.

Senator LEVIN. So that the attack which you think is the most likely would be against us when we have fewer—excuse me, when we have the most weapons with which to retaliate; is that correct?

General CHAIN. I see where you are leading. I am glad to answer whenever you get ready.

Senator LEVIN. Can you tell us why you think it would be most likely that the Soviets would attack us when we would have 10,000-plus warheads with which to retaliate and least likely when we have fewer warheads with which to attack?

General CHAIN. I believe that my primary task is to deter. I do not think the Soviets are ever going to attack the United States with nuclear weapons because to do it they are going to waste their country. If they try to do it from a generated case, it is only going to be as a last-ditch effort—that there is world tensions, we have a conventional war in Europe, that the SACEUR has asked for the tactical release of nuclear weapons, he shoots 100, he gets 200 back in his face—and we have escalated to the point that both sides are fully generated and someone on one side or the other decides to go to strategic nuclear war.

I do not think that will ever happen because we have enough weapons to see that it does not happen, and the Soviets have enough weapons to see that we do not initiate that war.

But people argue that the “bolt-out-of-the-blue” is most likely, and I reject that for this reason—the bottom line, that [deleted] weapons on alert today. So I say that the generated is the most likely because I think the only scenario that I see that nuclear war will ever take place in is when the superpowers are killing each other, they have started using theater nuclear weapons, and it has escalated to somebody for some reason deciding to waste it all and go to full nuclear war.

I think we have been very successful in deterring a nuclear attack and as long as we remain strong we will be successful, ad infinitum.

Senator LEVIN. It has been said that [deleted].

General CHAIN. Yes.

Senator LEVIN. Would you not agree that an attack against us when our forces are generated would also be highly unlikely?

General CHAIN. Absolutely.

Senator LEVIN. So they are both highly unlikely?

General CHAIN. Absolutely.

Senator LEVIN. Would you agree that when you say an attack on us when our forces are generated is the most likely [deleted].

General CHAIN. Absolutely. Only in comparison in a scenario. You know, you could ask why would anybody ever attack the United States with nuclear weapons. Day-to-day I do not think they ever are. The only scenario I can even see is where we have ended up being on a conflict which ends up to be a world conflict where theater nuclear weapons are being used, we are on the nuclear ladder and then for some reason somebody decides to use a few strategic weapons, and bingo, all of a sudden you are over the threshold.

Senator LEVIN. But you would agree that such an attack on us when our forces are generated would be suicidal for the attacker?

General CHAIN. Yes.

Senator EXON. Could I just interrupt there? I think there is one more thing we could throw in here, General, that I think maybe I referred to in my opening statement.

So many Members of Congress have not seen a strategic warning briefing that is available to them, and you have not stated that today. But is not another reason [deleted].

Does that fit into this pattern?

General CHAIN. It is not the information as far as what is in their mindset. The information is that, as I go through this chart one more time, they have [deleted] trains with SS-24s, [deleted] of which are in garrison; [deleted] SS-25 battalions, [deleted] of which are out in the field today and the rest are in garrison; [deleted] submarines, ballistic submarines, [deleted] of which are in garrison; [deleted]; armies, some of which are in the field; none of the population has moved to shelters.

I watch these things every day.

Senator EXON. Or, to put it another way, it would be militarily suicide for them to do a strike out of the blue?

General CHAIN. If they wanted to do it out of the blue, sir, I would assume that they were going to generate the bombers. [Deleted.] It would be damn tough for them to initiate an attack against the United States, thinking of being successful, knowing we have [deleted] weapons on alert that are coming back at them.

These are things that they hold valuable.

Senator EXON. Thank you. Do not charge that time to Senator Levin.

Senator LEVIN. It just seems to me that the argument here for the MX garrison on the ground that "bolt-out-of-the-blue" is unlikely assumes that there is some kind of a major difference between the likelihood of a "bolt-out-of-the-blue" attack and an attack when our forces are generated.

I think it is clear that in both instances they are highly unlikely. One might be slightly more likely than the other, but the key thing which does not come through from the presentation is that in both instances it is highly unlikely and in the one case may not be deterrable because you are talking, in the case of crisis which gets out of hand, that an irrational act is taking place because you acknowledge that an attack against us when our forces are generated would be suicidal for the attacker.

That is an irrational act, and that is what does not come through, I do not think, in the presentation. To say an [deleted] implies that the other one is significantly more likely.

General CHAIN. It does not imply that, and you know that does not imply that.

Senator LEVIN. It is not intended to imply that.

General CHAIN. Darn right it is not.

Senator LEVIN. So what I would suggest you do to avoid that impression would be to say on these attacks that neither one of these is likely. Neither of these scenarios is likely, but that [deleted].

I think that encapsulates your view, which I happen to think is correct—what you said here this morning.

General CHAIN. Throughout the whole presentation and as I started, today I can deter a nuclear attack. I can carry out my task. I think that the forces we have on alert does that day-to-day. "Bolt-out-of-the-blue" I think the forces we can generate would do that. So anyone that was going to try to attack the United States would be suicidal.

Senator LEVIN. Thank you, Mr. Chairman.

Senator EXON. Thank you, Senator Levin.

Senator Thurmond.

Senator THURMOND. Thank you, Mr. Chairman.

LEVEL OF DEFENSE SPENDING

General, there is little expectation among my colleagues that the level of defense spending over the next 5 years will grow in real terms. If this is the case, how do you propose that we deal with the simultaneous funding ramp-up associated with the two mobile missile program and with the Stealth bomber?

General CHAIN. I think the compromise that was worked out between the administration and the leadership on Capitol Hill is the proper way to go. I testified for the last several years that I believe in sequential deployment of the mobile systems.

I think mobility is very important for the United States in the ICBM, and I know that the country can afford to go Rail Garrison, followed sequentially by Small ICBM. We need to have mobility in the ICBM force.

At the same time, I have to have a bomber that can penetrate at the end of the century. We have chosen as a nation to do that through a Stealth bomber. We had another choice, and that would be a hypersonic bomber. [Deleted.] They do not conflict with each other; they are compatible and they complement each other.

This country can certainly afford it, and in SAC we have what we call a briefing on SAC 2000, which lays out in a constant dollar that we can do the Rail Garrison, we can do sequentially with the Small ICBM, and with the B-2. So the money is available, if people do not muck around with the strategic systems.

TWO MISSILE AND B-2 PROGRAMS

Senator THURMOND. General, as a warfighting commander, what priority do you personally attach to the pace and scope of the two missile programs and to the B-2 program?

General CHAIN. I support what the administration and the Congress have worked out in the submission of the budget.

Senator THURMOND. General Chain, there appears to be a strong relationship between the bomber counting rules in the U.S. START position which favor a penetrating bomber and the B-2 programs. Is this the case and what is the military implication of continued delays in the B-2 program under the currently-proposed START framework?

General CHAIN. The current slip in the B-2 is a fact of life. We were supposed to have test-flown that airplane last fall. We did not. We now hope to test fly it in the next couple of months. So I think that the B-2 slippage is a reality.

What we could not stand is for the B-2 to be canceled or to be slipped for many years, because [deleted].

So that B-2 is critical to my endorsement and my successors' and the Joint Chiefs of Staff's endorsement of a START Treaty.

B-1 ECM

Senator THURMOND. General Chain, some have suggested that we avoid the cost of fixing the B-1 ECM capabilities by making the B-1 a stand-off cruise missile carrier. What are the implications of such a course for both our military capabilities and our overall force posture under proposed START counting rules?

General CHAIN. [Deleted.]

So I cannot afford to have the B-1 go into a cruise missile carrier. [Deleted.]

Senator THURMOND. General Chain, is it the case that the primary mission for the B-2 will be the traditional penetrating bomber role in the SIOP against fixed targets, with the possibility of a future role against mobile targets? If this is the case, to what extent can air-launched cruise missiles be substituted for penetrating bombers against fixed targets?

General CHAIN. [Deleted.]

The advantage of the bomber is it goes to the geographic coordinate and if the target that he is supposed to strike has not already been struck he then strikes it, or, if it has already been struck, he then diverts and goes to his next target on that list, thereby maximizing the use of every weapon on board that bomber.

[Deleted.] So it is no advantage to use a cruise missile. I need a penetrating bomber to be able to hold fixed targets at risk. I need a penetrating bomber to be able to hold mobile targets at risk.

And, as Senator Glenn so aptly pointed out, its strength in the conventional role is unequalled.

Senator THURMOND. I understand my time is up. Thank you, General.

Senator EXON. Thank you, Senator.

Senator Glenn.

Senator GLENN. Thank you very much.

Just a preface to a question here. Did you have to clear your testimony with OMB?

General CHAIN. I do not think so, sir. I sent it to the JCS, who cleared it with OSD, but I do not know if they cleared it with OMB.

Senator GLENN. From what you submitted as your beliefs on your testimony were there any changes in what you originally submitted?

General CHAIN. Only one, and it was a request, not an order. I had the standards of measurement that we use on the four target categories—nuclear, leadership, other military, and economic. I had the benchmarks that we are held responsible and measure against. But since that is under review in the Defense Department today they asked me to remove those. I said fine because I did not think it added or subtracted from it. That is the only request.

Senator GLENN. All right. We have run into some problems in the past. Senator Gore ran into some. I have run into some on the Governmental Affairs Committee. I am making it rather standard these days to ask if there were changes, and people who come before us are duty-bound to give us any changes that were made in their testimony. They have to do that.

So I am making that a standard procedure here and all the other committees, and also for reasons that you are familiar with.

General CHAIN. Yes, sir.

INTELLIGENCE

Senator GLENN. A related issue here. You state in your testimony that intelligence remains a major force multiplier. You make a good case for it in the paragraph on the bottom of page 13, top of page 14. I agree with you absolutely 100 percent. It has to be timely, you stressed that, and cannot wait for many days and so on—all the reasons there.

I am very concerned that we are once again trying to terminate the 71. I know that comes under your shop. You do not like the extra expense of that thing and you wish we would transfer it out. But I asked for a study on a separate committee, and since we are in classified session here it came from the Agency back on what they saw as the value of the 71.

I have a whole sheaf of things where we did not have intelligence capability to get certain information in a timely fashion from any satellites. We used the 71. The requirement still exists. Yet we are suggesting we do away with that system.

I just think that is very shortsighted. The system still works and works very well, and it is usable on a timely basis that we cannot duplicate with satellites, at least not now.

Why are we terminating that—strictly a matter of budget?

General CHAIN. Strictly a matter of budget. For 10 airplanes it is going to cost me about \$400 million a year. We are down to six airplanes. We just had a crash, as you know, so the fleet is stood down until we find out what caused the engine failure.

It is a very valuable asset, very expensive to run. There are some systems—we are cleared in here—the [deleted] is being very successful. I met with Judge Webster yesterday and we discussed it. He did not have the same opinion, whatever the CIA submitted to you on the requirement for the SR-71 because we talked about it and we both agreed that it would be nice to have, but we cannot afford it.

And it was not, I will not say, ho-hum, but he did not have the same impression you just left me with.

Senator GLENN. I will talk to him, because not in Governmental Affairs but on the Intelligence Committee—I am on that committee now—they sent in a whole sheaf of things. They give example after example through the years and right up to the current time where the only way we got certain information we really wanted and could go after and do in a matter of hours was with the 71, where we could not duplicate it with satellites at all.

I think that is very valuable. I know it is a 25-year-old airplane, but it is still extremely valuable. That has been a real jewel.

General CHAIN. It has been, sir. [Deleted] the use of the U-2s and the TR-1s, which also have a great deal of time-sensitive capability. I was out at Beale last week and flew the U-2 again. With the sensors on board the U-2, coupled with the [deleted] systems, I do not think we are going to see a degradation on intelligence collection.

Senator GLENN. We are going ahead with the TR but stopping the SR-71?

General CHAIN. Yes, sir. It is much cheaper to run TRs than it is SR-71s.

Senator GLENN. Well, that is one we are going to address in the other committee and here, too, probably because I just think it is a mistake to give that one up.

B-2

To follow up a little bit on Senator Thurmond's comments on the B-2, there have been conflicting reports, press reports anyway, on what the mission of the B-2 is. About 6 or 7 months ago there were several articles in the paper here about what its role was.

We were going to bring it down some to perform a lower level mission than was originally planned, going in to make it extreme road recce, in effect going in to look for other targets. We are going to use other intelligence-gathering means to help them locate targets that are still being developed.

Have you clearly defined the mission now? I was very surprised to see the mission definition changing on that within the last 6 months or so.

General CHAIN. No. I think the envelope will continue to expand as we know more about the aircraft, but the primary mission will be a high-altitude penetrator. There are some areas in the Soviet Union and some targets that we would probably drop down, particularly in looking for mobile targets, but the primary mission is a high-altitude penetrator.

Senator GLENN. My time is up, but just one more. What is the basic problem right now in getting the first flight off? What is holding that up?

General CHAIN. Sir, I know you are a test pilot by background so you may have a better answer than I. I was out at Edwards a week and a half ago and met with the test team. They are convinced they are going to fly it in June.

The problems have been a standard problem in checking out any new aircraft. Anything that looked like it was not checking out right, the next step was to run all four engines, which they had not done yet, and waiting to see how that was going to work.

There was an environmental problem at one time. There was a hatch problem at one time—the normal routine things. As with a new aircraft, particularly an aircraft with the tolerances, you know, there cannot be any ripples and what have you. So as they walk through those things—and I am delighted that they have taken their damn time; the last thing I want is an aircraft that people try to beat up because it is not working well.

Senator GLENN. Just a statement here. Our technology on that is so advanced, not just in the radar-absorptive material and all that business, but it is a whole new area we are getting into in aerodynamics, control off the tips and the engines, and just the whole inlet. Everything is just so different.

Is there anything that is basic along those lines that is holding this up, or is it just checkout and details in getting systems to work individually? There is no basic concept change, then?

General CHAIN. No, sir. Again, I met with the test team. I met with the Air Force colonel who will be in the right seat of the first

flight that will fly from Palmdale over Edwards, and he tells me that it is strictly double-check, double-check, double-check, and that there is no basic problem with the air-frame.

But again I am relying on somebody answering my question. I am not an engineer, so I do not know.

Senator GLENN. It is now June?

General CHAIN. Yes, sir. There is a specific date in June also.

Senator GLENN. There is a specific date. When is that?

General CHAIN. It is toward the end of June.

Senator EXON. Thank you, Senator Glenn.

Senator Gore is graciously yielding to Senator Nunn because he has to go chair another meeting. Senator Nunn.

Senator NUNN. Thank you, Senator Exon. Senator Gore, thank you. I will just ask a couple of questions here. I have got to preside over another meeting going on right now. I appreciate your yielding.

General Chain, we are glad to have you. I wish I had seen your whole presentation. I will catch up on it. We value your testimony very much.

General CHAIN. Thank you, sir.

SURVIVABILITY

Senator NUNN. Two questions. One is what are the implications for survivability on matters we have been talking about here this morning in the next 10 to 12 years if the Soviets acquire a depressed trajectory capability?

General CHAIN. It is a nice hypothetical question, but right now, you know, the missile that they talked about before was the SSN-23 on the Delta-4 submarine, [deleted]. For that to happen it has to go exoatmospheric before it comes back in.

[Deleted.]

I was at CIA yesterday, spent the afternoon with them. [Deleted.]

Senator NUNN. Do you think it is possible technically for them to do so?

General CHAIN. I would assume that it would be possible.

Senator NUNN. Would it be to our advantage either through mutual restraint or some kind of agreement, not to develop the depressed trajectory?

General CHAIN. Sure. That would be a great negotiating position for the United States because the more warning that we have the better off we are and the more stable world we live in. The more warning that they have, the better off they are, and more stable world in which they live.

Senator NUNN. Do you have any need for a depressed trajectory in our own arsenal?

General CHAIN. No, sir, none. Depressed trajectory would be a first-strike weapon.

ARCHITECTURE FOR SDI

Senator NUNN. Thank you, General. Last fall we were briefed on the architecture for SDI. It seems to change. I do not ever know quite what it is, but whatever it is, do you think the current system

meets your requirements as strategic nuclear commander in chief—the current architecture?

General CHAIN. We were out at Space Command just recently. We had a series of meetings with them and I have people assigned out there to make sure we are working closely with them. If the country decides to build an SDI system—and right now you know, as well as I, it is in technological development only, because we have to abrogate a treaty if we are going to field such a system—it appears that the systems that they are working on would be satisfactory—the Brilliant Pebbles, those types, and the other things that they are working on.

But until the country makes a decision to field such a system I do not know where we are going to come out, because there seems to be a lot of theory but there does not seem to have been very many tests that have been carried out.

DEFENSIVE SYSTEMS

Senator NUNN. To carry out your mission, do you need defensive systems in the foreseeable future—to carry out your mission of deterrence?

General CHAIN. No. If we had defensive systems it would be a force multiplier. On the other hand, if we had a pure defensive system and the Soviets did not, that would end up putting us perhaps out of balance and that could lead to an unstable condition.

If the United States fields defensive systems, I would support the Soviets fielding them simultaneously so that we continue to have relative stability. I would be very concerned if we ever had one side or the other having a significant, disproportionate capability against the other because then it could lead one to think that one could perhaps have a nuclear war and get away with it.

Senator NUNN. Even if that side were us, it would give you some concern because it might affect their psychology and might even affect their psychology of hitting first?

General CHAIN. Exactly.

Senator NUNN. So I assume that you will be very interested in having a say-so, you or your successor, as this goes along.

General CHAIN. Absolutely—principally my successor, since I have 2½ years left and it will be mid-1990s before I think we will be making the tough decisions.

Senator NUNN. And you are being kept in the loop on it?

General CHAIN. Yes, sir.

Senator NUNN. Thank you, Senator Exon. Thank you, Senator Gore.

Senator EXON. Senator Nunn, thank you very much.

Senator NUNN. And thank you for your recent letter. I appreciate that.

General CHAIN. Thank you, sir.

Senator EXON. I am happy to recognize Senator Gore. I would tell you, Senator Gore, that you have been very patient and we appreciate that. If you would agree not to ask any questions about the Small ICBM, we might even give you 6 minutes. [Laughter.]

In any event, I recognize you.

Senator GORE. You drive a hard bargain, Mr. Chairman.

General Chain, thank you for your excellent testimony. Although I did not arrive until after you had presented part of it, I have read it carefully and looked at the information. Having sat through a lot of testimony about ICBM modernization, I have learned to appreciate a very carefully constructed, well-presented testimony, and I do appreciate what you have said and the way in which you have said it.

PROGRAMMATIC PATTERN OF SEQUENTIAL DEPLOYMENT

You have talked really as the first witness from the administration that we have had who has talked candidly about sequential deployment. I am wondering whether you can put any flesh on those bones by talking about the programmatic pattern of sequential deployment, with IOCs and FOCs for each system. Is that possible?

General CHAIN. In a limited fashion. To the best of my knowledge, I was out at Ballistics Systems Division, which used to be BMOE, which I am sure you have visited, a week and a half ago to talk to them about that, because the administration and the leaders on Capitol Hill had appeared to have reached an agreement, and that was the same question that I asked.

Do we have enough money in the budget to be able to make sure that we do proceed sequentially? The numbers that are in the budget for 1990 and 1991, which is the budget under review right now, seems to be satisfactory. It will have to be ramped up in the outyears. What that ramping is is beyond my expertise.

The Secretary of Defense and the President have said they would like a 1997 IOC, which I strongly support. They would like to have all systems fielded, as I understand it, by the year 2007. I obviously would like to see that happen earlier than that, but I also recognize in the budget crunch in which we are, I have to support the sequential approach.

Two years ago I testified that I needed both of them and I wanted both of them now, and I wanted 100 Peacekeepers in Rail Garrison. Last year, again because of the budget crunch, I said I needed 100 Peacekeepers. Now I am in a position because the budget is even crunched further of saying I support 50 Rail Garrison and the sequential deployment of the Small ICBM.

I have been a supporter of the Small ICBM ever since I have been CINCSAC. I think the only way the country can afford it, unless the country is willing to put more money into defense—which the country can afford—and with your indulgence, not taking any time away from the Senator, I am appalled that we are now about to punch through the 5 percent of GNP going into national defense, which will be the lowest than at any time in our history since the advent and breakout of the Korean war.

And there was only a little shallow between World War II and Korea. This country can afford more of the GNP going to defense, and I am appalled at the direction we are taking. We should not be arguing sequential on something as important as ICBM modernization. We have been stuck in this position because we—you, me, the politicians as well as the military—have not been able to convince the country that more money needs to go into national defense.

I am very concerned about it as a military officer.

Senator GORE. Your intelligence collection systems do not include lip-reading, do they?

General CHAIN. No, sir. Well, not your lip-reading. Perhaps other people's lip-reading.

Senator GORE. The bind you so clearly describe for us does include both aspects of fiscal policy and that is not our purpose here but I agree with you on the 5 percent figure absolutely, and I know that most people on this subcommittee do.

I would like to follow up with your staff on some further details on the programmatic sequencing.

BAN ON MIRVED LAND-BASED MISSILES

What happens if the President proposes and gets a ban on MIRVed land-based missiles? How long would it take us to ramp up Midgetman in that event? I mean, I am assuming that you agree with the obvious, that if we had such a proposal as part of a treaty the priority that would be placed on IOC and FOC for Midgetman would increase right away.

First of all, do you agree with that? And, second, in that event how long would it take to ramp up, in your opinion?

General CHAIN. I have no idea. It would depend on how much money was thrown at the program. I cannot believe that the United States would propose such a thing because we have 500 Minuteman IIIs that have three warheads on them. We have got 50 Peacekeepers with 10 warheads on them. Our submarines are MIRVed. We would have to shift the whole nuclear structure significantly.

The Soviets have the SS-18s, they have the SS-24s. I do not think that we have enough money to go toward deMIRVed systems on both sides.

BAN ON MOBILE MIRVED LAND-BASED MISSILES

Senator GORE. We would pay a lot to get rid of all of the SS-18s and all of the SS-24s, but let me change the question to make it a question about a ban on mobile MIRVed land-based missiles, under those circumstances also, and that is much more in prospect, as I understand the discussions.

Under those circumstances the priority assigned Midgetman would also increase significantly?

General CHAIN. [Deleted.]

Senator GORE. [Deleted.]

Senator GORE. Now in a START agreement if you did not have the feature I described I assume you agree that the combination of MX rail and small mobile would be better than MX alone?

General CHAIN. Absolutely.

Senator GORE. Now, in any event, given your view that cuts beyond the START levels that have been under discussion would endanger deterrence by undermining your ability to get at the essential Soviet target base, what would be the effect of a Soviet defensive system?

General CHAIN. It would be very destabilizing. As I tried to answer Senator Nunn's earlier question, I think that if either side fielded a defensive system, an SDI on either side, without the recip-

ient fielding a similar system it would end up destabilizing the balance of power, and I think that would be very unhealthy for the world.

Senator GORE. If the chairman will indulge me, if I can take advantage of my overtime grace period—

Senator EXON. You have violated every other agreement. Go right ahead, Senator Gore.

Senator GORE. I was interested in the argument advanced by Senator Levin earlier—and I wish he was here; I do not wish to take advantage of his absence here. I was interested in his discussion with you and the argument that we are so secure that we really need neither MX rail nor Midgetman.

General CHAIN. If that was his argument, it was an absolutely fallacious argument.

Senator GORE. Well, you are taking advantage of his absence more than I am.

Senator EXON. I will protect him as best I can.

Senator GORE. The fact that a particular scenario is unlikely does not mean it has no significance.

General CHAIN. Absolutely.

Senator GORE. Even if it has a de minimis military likelihood, it can have tremendous political significance.

General CHAIN. Absolutely.

Senator GORE. And indirectly have military significance if it exists at the end of a logical chain which affects the calculations made by both sides at the beginning of that logical chain. You can call it a ladder of escalation if you like, but the existence of an ability to gain an advantage in a first strike is at the apex of an entire structure of geopolitical strength which both superpowers have believed in and acted as if they felt was real.

So we cannot ignore the ability to gain an advantage in a first strike, even a "bolt-out-of-the-blue," the most unlikely of all scenarios. And if we had a post-START environment—and I want the record to reflect that you are nodding your head affirmatively in agreement here—if we had a post-START regime, what happens if we had no mobiles, if we had neither Rail Garrison nor Midgetman, and they had about half of their force in mobiles?

What would happen at that point?

General CHAIN. [Deleted.]

PRIORITY WEAPONS IN A SOVIET ATTACK

Senator GORE. I have only two other questions. In calculating what a Soviet attack would look like do we have a model which prioritizes, which reflects what we believe their priorities would be in allocating their weapons against U.S. targets?

General CHAIN. Yes. And I briefed that earlier and I will be happy to quickly summarize.

They have about [deleted] targets that they want to attack in the United States. They have over [deleted] weapons with which to do that. We think that they will obviously put down several weapons on each silos. We think they will put down several weapons on each nuclear base, to include air bases and submarine bases. We see them putting nuclear weapons down on each launch control fa-

cility, each nuclear storage site, the leadership of the United States, to include Capitol Hill as well as the White House, the Pentagon, and what have you.

Senator GORE. You do not mean they are going to aim at us?

General CHAIN. It may be to their advantage not to attack.

Senator GORE. All right. You will have a chance to review the record and make edits on this [Laughter.]

Senator EXON. Senator Gore, I have a question or two.

Senator GORE. I am going to finish up real fast, Mr. Chairman.

I wanted to ask you about this scenario. Let us say that we had an escalating crisis of the kind that you began to sketch out in your earlier comments and one of your successors advised the President of the United States to open up the Rail Garrison and roll out the MX in preparation for a higher likelihood of attack.

And the President of the United States said, well, look, you just do not know these messages I have been getting from the head of the Federal Republic and from the head of Great Britain and I think that would be so provocative that I am just very concerned about doing it. And so he held off or she held off and at a later time, when it became clear that that risk had to be run of furthering the political instability, the doors were at a later stage in the crisis opened up and it was rolled out.

At that point, during the following 6 hours would not each one of those mobile MX missiles become a much higher priority target for a Soviet planner than any other weapons system?

General CHAIN. No. One, to attack 25 trains and make that a higher priority than the Minuteman fields, the bomber bases, the submarine bases and what have you, I do not think it would have any higher priority. The train can stop and be able to fire at any time that they are out there on the tracks.

By moving the trains out it does not increase our offensive capability to the Soviet Union; it only increases our defensive capability. So it is not more threatening. The more threatening things we do is when we generate the bombers and when we send the submarines to sea.

So if I was the Soviet planner the two things that I would be watching in the United States is what are they doing with the subs, have they started getting the crews back and what the hell is Chain doing with those bombers? Has he started loading them out? That is the high threat.

Moving the trains off is ho-hum because they can shoot from the garrison. They do not have any more offensive capability on the tracks than they do in garrison.

Senator GORE. I will pursue it on another occasion. I appreciate the indulgence of the chairman. Thank you.

General CHAIN. Come to SAC and let us talk more to you.

Senator GORE. I will be out there soon and I will look forward to it. I enjoyed my trip to BMOE. They really have a great shop there.

Senator EXON. Thank you, Senator Gore.

General, I know you have considerable time constraints and we are going to get you out of here in 2 or 3 minutes. There may be some additional questions for the record from the chairman and others. We would appreciate your responding as quickly as you could, General.

ICBM MODERNIZATION

I have just two or three short questions and comments I would like to make. I agree with Senator Gore on Senator Levin's line of questioning. I think it was not clear exactly what he was getting at. But I believe we can summarize that up by saying that, despite your presentation and your concerns and all of the strengths that you say we have come down to the situation, none of the above will work unless we have modernization of the ICBMs; is that correct, General?

General CHAIN. Exactly. I interpreted Senator Levin's questions to say, General, can you deter today "bolt-out-of-the-blue," the answer to which is yes. General, can you deter today in a generated posture? The answer to which is yes.

If he was trying to lead to something else in there, then I am just not smart enough to sort through all the obfuscations.

Senator EXON. I would simply say that I listened with great interest to the line of questioning by Senator Gore on this whole matter of strategic planning. I took it that he feels that the Soviets might gain some advantage by a [deleted].

General CHAIN. [Deleted] and if they did they would get [deleted] weapons back in their face.

It does not make any damn sense to me.

Senator GORE. I can clarify, if the chairman wishes.

Senator EXON. Would you clarify it?

Senator GORE. Yes. I do not think it would make any sense at all for the Soviet Union to launch a first strike in a "bolt-out-of-the-blue" attack or otherwise. I do think that throughout the entire nuclear age even the theoretical possibility of an advantage in the number of systems left on each side after an attack initiated by an aggressor has been assigned tremendous geopolitical importance.

And both nations have feared the acquisition of such a capability by the other. The entire impetus to develop SDI here in the United States comes in part out of a similar fear that the Soviet Union might prospectively gain such an advantage and not use it in a military attack but use it to politically intimidate the United States and gain an advantage in Europe and other key areas of the world.

Senator EXON. Thank you for that clarification.

I will recognize Senator Thurmond. He has one question and he will have some questions for the record, General.

Senator THURMOND. Mr. Chairman, I will just ask one question and let you answer the rest for the record.

B-2 COST EFFECTIVENESS

General Chain, many of us in Congress find it difficult to reconcile the cost effectiveness arguments for the B-2 when our constituents read that the airplane costs \$500 million each. Do you believe that the case for the B-2 should be made on the basis of strategic weapons on target alone, as appears now to be the case, or do you think that the case for the B-2 should be broadened and, if so, in what way?

General CHAIN. The B-2 has great nuclear capability. The B-2 has great conventional capability. And it will be an aircraft that

will serve this country for 30 or 40 years. The B-2, as far as weapons on target, costs about the same amount of dollars per weapon on target as the B-1, both of which are significantly less than the Small ICBM or the Trident submarine.

The cost of the total program is significantly less than the Apollo program that we sent the people to the moon, from which we got some nice scientific advantage, but the Apollo program did not provide and will not provide 30 years worth of nuclear deterrence for the country.

The B-2 aircraft is relatively expensive, about 17 percent more than each B-1, but as far as its combat capability it is going to be unequalled. The United States is going to get more than its money's worth of deterrent power out of that B-2, and people that go and argue on the periphery are arguing against the deterrent power of the United States, and I strongly object to it.

Senator THURMOND. I have supported the B-2 so far, but many people come to me and say that is just too much money to put into any one plane. A plane could fall and you have lost \$500 million. They seem to think that other planes can be built cheaper that might suffice.

General CHAIN. I cannot build anything cheaper that can penetrate the Soviet Union after the year 2000. I could build another one, more expensive, hypersonic, sub-orbital, and now you are really talking money. Again, I repeat. [Deleted] which is going to be astronomical in cost.

Senator THURMOND. I presume then that you would train those pilots to handle that B-2 over and over and over again before you put them on it.

General CHAIN. Not only will they be trained in the aircraft but we are also going to have a compatible trainer program where they will fly the F-38, which is a very inexpensive aircraft, to make sure that their pilot skills are maximized at all times.

Senator THURMOND. It would be unfortunate if anything happened to any one and it did fall. The public would say well, there goes \$500 million. So I just suggest to you that every step you take when we get the plane, that the pilots be exceptionally well trained, more than the pilots in the past.

General CHAIN. I could not agree more with you, sir.

Senator EXON. Thank you, Senator Thurmond.

Senator GORE. Mr. Chairman, maybe we could put an OMB official on each one of these planes.

Senator EXON. I would simply say in concluding this hearing that there is a general misunderstanding of the B-2. I have followed that program very closely. It has not flown yet. If it flies, then I think we should get some of those in inventory as quickly as we can. I would think, General, that you would feel a whole lot better today even if you had 10 B-2s in inventory.

General CHAIN. I would be more comfortable.

Senator EXON. It is a tremendously advanced system and cannot be compared, I think, with conventional airplanes. It is a totally new system that in my view would cause the Soviet planners more headaches than anything else we now have.

General, thank you very much for being here. It was a tremendously informative hearing. We appreciate your patience and we are adjourned.

[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR CARL LEVIN

MOBILE ICBM OR B-2

Senator LEVIN. In your personal opinion, if the defense budget constraints forced you to make a decision between having two mobile ICBMs or having the B-2 bomber, which weapon would you defer or cut?

General CHAIN. Senator Levin, we have already made tough fiscal decisions on each of these programs. Each of these weapon systems has been carefully studied, prioritized, and if necessary, restructured. For instance, the production decision for the B-2 bomber has been delayed one year. Additionally, to meet a SICBM IOC of 1997, funds have been diverted from the Rail Garrison program.

I do not support cutting any of these weapons systems. The budget worked out by the administration and Congress allows for the timely and sequential deployment of each system. In my opinion, the modernization and deployment of these programs will allow us to maintain our most important goal—credible nuclear deterrence into the next century.

MX MISSILES

Senator LEVIN. Are the existing MX missiles more survivable against a Soviet surprise nuclear attack in hardened silos, as they are currently deployed, or when they are deployed in railcars in garrison (i.e., not dispersed)?

General CHAIN. First, I believe a surprise nuclear attack would be a most unlikely occurrence. It would be an irrational act that would not give our adversary any distinct advantage. Second, Peacekeeper missiles in hardened silos would have a higher probability of survival than nondispersed rail garrison missiles. Third, I resist overemphasizing the word "survivability" which implies all or nothing usefulness. Nothing is "perfectly survivable" when subjected to a specific attack. Through silo hardness, or better yet, mobility, we cause the enemy to expend great effort and many resources to attack our ICBMs. Mobility extracts the highest price to attack that we can impose on the Soviets and increases crisis stability. The best and most expeditious way to achieve mobility is to put 50 Peacekeeper missiles on Rail Garrison trains with an IOC of 1992.

BAN ON LAND-BASED MOBILE MIRVED MISSILES

Senator LEVIN. Do you personally favor a negotiated ban on the deployment of U.S. and Soviet land-based, mobile, MIRVed missiles?

General CHAIN. As you are aware, the current U.S. negotiating position is to ban mobiles. However, I sense that this position will change to allow mobiles, and I strongly support such a shift. Mobility adds to stability and, therefore, I believe the U.S. should have mobile ICBM systems.

Mobile systems are very difficult to attack. Mobility complicates Soviet War Planning and creates an "uncertainty" in their minds that an attack would be worth the price. Although MIRVed mobile systems may appear to be more lucrative targets than single warhead systems, the challenge to hold MIRVed systems at risk is equally as difficult. As such, I believe the best and quickest way to deploy a mobile system is to put 50 Peacekeeper missiles on trains with an IOC of summer 1992. Thus, I strongly support the administration's proposal to first field Rail Garrison in 1992, followed by SICBM in 1997.

U.S. WARHEADS

Senator LEVIN. During your classified briefing you cited specific numbers of U.S. warheads that would be available to retaliate against a Soviet nuclear first strike when U.S. strategic forces were in a generated status and on day-to-day alert status. Will you provide unclassified figures for both of these scenarios?

General CHAIN. Unfortunately, Senator, unclassified figures are not available. The nature of this information involves many intelligence and other sensitive sources, and its revelation would disclose our post-strike capabilities, as well as our estimates of Soviet capabilities.

QUESTIONS SUBMITTED BY SENATOR JOHN GLENN

KC-135R PROGRAM

Senator GLENN. General Chain, you and other witnesses have stated that the KC-135R program provides 50 percent more mission capability than the original KC-135A. You have stated that you strongly support continuing the engine conversion program and that it is integral to the success of SAC's nuclear and conventional missions.

Apparently, the Pentagon does not agree with you. I understand that the proposed budget requests only 24 aircraft in fiscal year 1990 and 20 in fiscal year 1991. These numbers are approximately half the conversions normally completed each year since the program started in fiscal year 1987 and well below the economic production rate. If the fiscal year 1990 and 1991 rates are maintained, it will take well past the year 2000 to complete the conversion of the tanker force.

Can you tell us why the KC-135R conversion program has been reduced so drastically?

General CHAIN. I strongly support the KC-135R engine conversion program. However, the procurement level for the program reflects the fiscal reality of the shrinking DOD budget. All SAC programs have been carefully studied, prioritized and if necessary, restructured. For fiscal year 1990 and 1991, 24 KC-135R kits have been programmed to be procured.

RWR APPROACH

Senator GLENN. General Chain, while I understand the need to provide B-1B crews with increased threat situation awareness, I would like to better understand why a stand-alone RWR approach has been selected.

Is this the lowest cost approach? If not, why not?

Have any other approaches been considered, such as a single frequency encoder, that maintain in the integrity of the basic ALQ-161 system as originally designed? If so, what is the status of these other approaches?

General CHAIN. After the Air Force determined that the ALQ-161 basic receiver architecture could not support total situational awareness, the Air Force Electronic Combat Office (AFECO) was tasked to conduct an independent assessment of the ALQ-161. The AFECO was also tasked to study a range of options for the system. This range of options consisted of:

- (1) Options within the ALQ-161 architecture:
 - a. Totally rewrite software.
 - b. Apply Band 1-3 receiver to SAC identified top 11 threats.
 - c. Single Frequency Encoder (SFE).
- (2) Augment ALQ-161 architecture.
 - a. Add a wide-band receiver.
 - b. Add stand-alone Radar Warning Receiver (RWR).
- (3) Replace parts of ALQ-161.
 - a. Replace with ALQ-172 and RWR.

The AFECO did a quick-look evaluation of these options with regard to first install date, technical risk, business risk, and cost. Based on these four areas, the most viable alternative was to continue to CORE, install a stand-alone RWR, and also to continue evaluating the SFE.

The SFE option was evaluated extensively by the AFECO, the B-1B SPO, and SAC. The group unanimously agreed that the SFE has technical merit and the B-1B SPO plans, to have all continue working on the SFE, for further evaluation, once CORE flight testing begins.

B-1B AND ILS CAPABILITY

Senator GLENN. General Chain, in reviewing the report of the B-1B crash at Ellsworth AFB, I was surprised and dismayed to learn that the B-1 does not have a full ILS capability. Given the night, all-weather mission of the B-1, I find this lack of a precision approach capability hard to understand.

Will you tell this committee what is being done to correct this deficiency?

General CHAIN. As the report pointed out, the lack of an ILS was not a contributing factor to the Ellsworth accident. On the other hand, I recognized the need for enhanced ILS capabilities and directed a two phased program to expand the B-1 ILS system.

The completion of Phase I will correct the deficiency in the vertical situation display (VSD) concerning the ILS symbology display. This will give the B-1 a manual

(hand flown) ILS down to 200-foot minimum. This is funded this year (\$3.0M) and will be completed by November 1989.

Phase II will correct the flight director computer (FDC) and will provide pitch and bank steering commands optimized for the B-1B's unique performance characteristics. Currently, the full optimization is planned for fiscal years 1991-92 at a cost of approximately \$10M. We are continuing to explore ways to accelerate the full optimization of the ILS/FDC system.

B-1 OPERATIONAL ACCIDENTS

Senator GLENN. There has been a lot of media attention regarding the three B-1 operational accidents. It is my impression that given the number of flying hours the B-1 force has flown since its introduction in 1986, that the overall accident rate is excellent for a new operational high performance aircraft. What is your assessment?

General CHAIN. The B-1 compares very favorably in its first two complete years of operational service with other SAC bombers. The class A mishap rate which is the number of Class A mishaps per 100,000 flying hours are as follows:

	Calendar year	Rate
Aircraft:		
B-1B	1987	8.20
	1988	9.03
B-52	1956	26.92
	1957	10.17
B-58	1961	21.95
	1962	24.91
FB-111	1970	25.16
	1971	5.41
F-15	1977	14.16
	1978	11.59
F-16	1979	30.64
	1980	18.65

The numbers speak for themselves. A similar comparison between the B-1B and more recently developed high performance fighter aircraft such as the F-15 and F-16, is also very favorable.

LEAKS OF THE B-1 CRASH ACCIDENT REPORT

Senator GLENN. General Chain, as you know, the "official use only" section of the accident report on the B-1 crash at Dyess was leaked to the press. As a consequence, it has been suggested that maybe selected Members of Congress should be allowed to review the restricted sections of the accident reports in order to provide oversight of the findings and recommendations of the accident board.

Is this a good idea?

General CHAIN. Senator Glenn, I don't believe the release of restricted sections of accident reports would be a good idea. The concept of safety privilege is the cornerstone of the military mishap prevention program. Safety privilege guarantees that all volunteered information will be used solely for mishap prevention—not disciplinary actions or litigation. It guarantees the confidentiality of witness and contractor testimony. Release of privileged information to Congress could be viewed as a violation of the use of data for "mishap prevention only" and years of mishap experience. It is this trust, both perceived and real, which enables contractors, witnesses, and mishap participants to be candid and willing to come forward with potentially damaging information. This privilege allows the services to quickly get to the cause of mishaps, take corrective actions, and protect national security resources.

D-5 DEVELOPMENT PROGRAM

Senator GLENN. General Chain, can you tell us what went wrong with the first underwater launch of the Trident D-5 missile and where do we stand today with the D-5 development program?

General CHAIN. The formal Navy response is that analysis of telemetry data and recovered missile hardware has confirmed a failure of the mechanical linkage transmitting the nozzle commands to the nozzle exit cone. The impact of this failure on

the D-5 development program, when combined with the loss of second stage motor casting capability due to a propellant mixer fire at Hercules and a strike at the Kaiser plant manufacturing nozzles, is a 3-month delay of the IOC until March 31, 1990.

ACM DEVELOPMENT PROGRAM

Senator GLENN. Can you also bring us up to date on the ACM development program?

General CHAIN. Since last April, [deleted] has taken place. An [deleted] in the operational flight software and [deleted]. A productionized fix to one of the avionics problems has been demonstrated in a [deleted] capability from a B-52. [Deleted.] The missile [deleted]. The ACM [deleted] missile [deleted].

Thus far, approximately [deleted] will be required to gather the data necessary to complete the validation of ACM's capability to meet the user's needs. [Deleted.] These tests are part of the second source program and will evaluate McDonnell Douglas Missile Systems Company's progress in qualifying itself as an ACM producer.

Ground test and subsystem qualification is progressing nicely. [Deleted.] Qualification of the added requirement for an [deleted], the remaining component, is scheduled for [deleted]. Missile functional configuration audit (FCA) [deleted]. However, as is customary in system development, some delta qualifications are being conducted on components where significant producibility improvements have been made. All delta qualifications are planned to be complete by [deleted].

With respect to aircraft integration, [deleted] acoustic testing and portions of climatic environmental testing. These ground test [deleted]. Our schedule calls for [deleted]. The DT&E/IOT&E final reports, covering ACM qualification on the B-52H and preliminary qualification on the B-1B should be finished and delivered by [deleted]. Final B-1B/ACM integration efforts [deleted] were stopped in December 1988 and deferred pending review by the Office of the Secretary of Defense.

[Whereupon, at 12:15 p.m., the subcommittee adjourned.]



**DEPARTMENT OF DEFENSE AUTHORIZATION
FOR APPROPRIATIONS FOR FISCAL YEARS
1990 AND 1991**

WEDNESDAY, MAY 31, 1989

**U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC FORCES
AND NUCLEAR DETERRENCE,
COMMITTEE ON ARMED SERVICES,
*Washington, DC.***

SPACE LAUNCH AND C3 PROGRAMS

The subcommittee met in executive session at 2:07 p.m. in room SR-232A, Russell Senate Office Building, Senator J. James Exon (chairman of the subcommittee) presiding.

Committee members present: Senators Exon, Nunn, Levin, Wirth, Thurmond, and Gorton.

Committee staff member present: Arnold L. Punaro, staff director.

Professional staff member present: T. Kirk McConnell.

Minority staff members present: Patrick A. Tucker, minority staff director and counsel, and Brian D. Dailey, professional staff member.

Staff assistants present: Tiffany E. Berger and Mickie Jan Wise.

Committee members' assistants present: Jeffrey B. Subko, assistant to Senator Exon; Kenneth N. Luongo, assistant to Senator Levin; Milton D. Beach, assistant to Senator Glenn; Grayson F. Winterling, assistant to Senator Warner; Robert M. Soofer, assistant to Senator Gorton; and Charles G. Percy, assistant to Senator Lott.

OPENING STATEMENT OF SENATOR J. JAMES EXON, CHAIRMAN

Senator EXON. The subcommittee will please come to order. The subcommittee meets this afternoon for an important review of the space launch, command, control, and communications program.

A few weeks ago the committee heard a rather scathing and provocative indictment of our space posture from General Piotrowski, Commander of the U.S. Space Command. General Piotrowski's net assessment was very discouraging. By his reckoning, we have serious deficiencies in satellite survivability and replenishment capability. We have many booster types now, but little launch redundancy. It takes literally months to integrate, test, launch, and check out a satellite before it becomes operational.

This incredibly complex and time-consuming process requires a standing army of skilled civilians, each regiment of which is inflexibly dedicated to specific boosters and payloads.

Our approach to satellite design and operation is efficient in peacetime and our technical advantage in peacetime performance is marked, but we face potentially disastrous wartime consequences, if the General's view is correct. We also believe we are designing the wrong kind of satellites in DOD and the national space program for war-fighting.

In short, our Space Command Commander in Chief believes we must undertake a wholesale revision of the way we do business in space. We need totally different types of space boosters, even though the ones we have now are newly developed; and we need totally different approaches to designing satellites.

In terms of policy and resource allocation, the General's views have profound implications. I must point out as well that the lack of satellite survivability and flexibility is arguably the greatest concern for our tactical conventional forces, rather than our strategic forces.

What we did not hear from General Piotrowski are a realistic timetable and cost estimate for fixing the problems he perceives, or an assessment of the priority this issue should have compared to other defense programs, and indeed compared to specific and costly new space capabilities that he advocates.

The picture that the General paints is disturbing. The United States and its allies are highly dependent on various satellites in wartime, and yet these satellites are vulnerable. Even if the United States had an ASAT capability, the Soviets can replace whatever they lose, while we seemingly cannot.

The obvious implication is that an ASAT capability alone cannot possibly compensate for our weaknesses. I believe it is time for us to develop a consensus on policy, policy for space systems survivability and responsiveness to guide the incremental decisions that must be made on many programs in the years immediately ahead.

The General has contributed to this end. In today's hearing I intend to explore some of our policy positions, what they are going to be in the future, along with resources and programs issues raised by General Piotrowski. In addition, I have a number of questions about important command, control, communications, and surveillance programs, including MILSTAR, the Navy's UHF Follow-on satellite, TACAMO, the strategic communications aircraft block upgrade, the boost surveillance and tracking satellite, and the proposed space-based radar programs.

I want to welcome our witnesses here today. They are an impressive group from OSD, the Air Force, and the Navy. Dr. Thomas Quinn from C³I; Dr. George Schneider—is that the right pronunciation?

Dr. SCHNEITER. "SHNY'der," Senator.

Senator EXON. "SHNY'der," is that right?

And Major General Moorman from the Air Force, acquisition; and Rear Admiral Cargill representing the Office of the Chief of Naval Operations.

Thank you, gentlemen, very much for coming here to be with us today. Our plan is to entertain brief introductory remarks from each of you and then begin the question and answer period.

I just wanted to say to you that I tried to set the tone of the opening assessment that we have had previously on this matter. I hope that you will be able to shed a more positive light on some of the things that are now of major concern to us.

And with those remarks and looking forward to your testimony to help us out in all of this, I would ask you to proceed at this time. You may proceed in any fashion or order as you would like. Is there anyone that would like to go first?

Doctor.

STATEMENT OF DR. THOMAS P. QUINN, PRINCIPAL DEPUTY ASSISTANT SECRETARY OF DEFENSE FOR COMMAND, CONTROL, COMMUNICATIONS, AND INTELLIGENCE

Dr. QUINN. Thank you, Mr. Chairman.

I appreciate this opportunity to come and discuss the Department's strategic command, control, and communications program.

Accompanying me are: Dr. George Schneider, who is the Deputy Director of Research and Engineering for Strategic and Theater Nuclear Forces; Major General Tom Moorman, who is Director of Space and SDI Programs for the U.S. Air Force; and Rear Admiral Bruce Cargill, who is the Deputy Director, Space, Command and Control, U.S. Navy.

And with your permission, I would propose to make a brief statement, and be followed by Dr. Schneider, General Moorman, and Admiral Cargill, and then we will answer questions.

Senator EXON. Thank you very much for that. Without objection, we will enter into the record the complete statements, which were very well done by each of you, and ask you to please summarize. And so if you will then proceed, doctor.

Dr. QUINN. Thank you, Mr. Chairman.

Let me begin by reviewing the substantial progress that we have made in the improvement of our strategic C³ systems. About 8 years ago we developed a plan to modernize the strategic C³ capability as part of the President's strategic weapons modernization program. As a matter of fact, the President assigned the highest priority to C³ as a part of that modernization effort.

The strategic C³ system basically consists of three components. There are the command centers, the communications systems which take decision information and transmit it to the forces, and then there are the sensors. And I will discuss our ongoing programs and progress with some brief examples in each of those areas.

In the area of communications, for example, we are deploying the Ground Wave Emergency Network, or GWEN. That is a terrestrial system made up of proliferated, EMP-hardened radio relay stations and associated receivers. It is a solution which relies on proven technology to help ensure communications during a nuclear attack.

We are also producing miniature receive terminals for installation on our strategic bombers. These will improve the communica-

tions between airborne command posts which can survive an attack and our strategic bomber force. Similarly, our ability to communicate with the strategic submarine force will improve as the aging TACAMO aircraft are replaced with new, more enduring and higher performing E-6A aircraft, an aircraft based on the AWACS airframe design, EMP-hardened, and which has considerably greater range than the current TACAMO.

And all of these systems are planned to be fully operational within the next few years.

A long-term solution to improving the capability of our strategic forces to operate during a nuclear attack is the MILSTAR satellite communications system. It is one of the most critical of our strategic C³ programs. Using advanced technology along with survivable ground-based control stations, the system is designed to survive and function through a major nuclear exchange.

Considerable progress has been made in developing the MILSTAR system. The Defense Acquisition Board recently approved moving into the production phase for the Navy and Air Force terminal segment and, if we stay on our present course, the entire system will be on line in the early nineties.

Now, since the fleet ballistic missile submarine force is the most survivable leg of the strategic triad, it is essential that the communications to and from that force do not compromise its survivability. The extremely low-frequency communications system will significantly improve those communications.

The ELF system allows continuous contact with the submarines while they operate at great depths, thereby decreasing their vulnerability. In order to increase the coverage area and the resistance to jamming and nuclear effects, our very low-frequency and low-frequency communications capabilities are being upgraded. As a part of this effort, we plan to add miniature receive terminals to the B-1 and B-52H bombers and to improve the transmission capabilities from the airborne command posts and the TACAMO communications relay.

The Defense Satellite Communications System (DSCS) provides super-high-frequency secure voice and high data rate satellite communications for a variety of missions. It supports worldwide crisis management, early warning relay, and diplomatic traffic.

It is used by the national command authorities, the diplomatic telecommunications service, and the mobile forces of all U.S. services and selected allies.

The existing DSCS-II satellites are being replaced with more capable DSCS-III satellites, which have anti-jam, null steering antennas, and carry single channel transponders for nuclear force execution and command.

The Fleet Satellite Communications System, FLTSATCOM, provides worldwide ultra-high-frequency communications to a variety of mobile users. We are currently acquiring a new Follow-on UHF satellite system to replace the existing FLTSATCOM satellites as they reach the end of their useful lives. Admiral Cargill will say more about FLTSATCOM.

Although not officially categorized as a strategic C³ system, the NAVSTAR Global Positioning System will support strategic nuclear forces by improving our capabilities for navigation, weapons de-

livery, force control, precision surveys, and many other potential applications. It is a space-based system with worldwide coverage that provides accurate, three-dimensional position, velocity, and time information.

The GPS satellites also carry sensors to detect nuclear detonations.

The first production satellite was launched on February 14 of this year.

Turning now to our command centers, their survivability and capability to manage and direct our forces have also been upgraded. As an example, the Military Airlift Command's global C² system has been improved with new data processing equipment, new decision support equipment, and other major command center improvements.

We have also reduced the vulnerability of our command posts to EMP effects. The support equipment, ADP, and communications suites of the E-4B national airborne command posts have also been upgraded.

Crisis management centers have been established to better coordinate management decisions at all levels of crises up to and through a nuclear exchange.

In the sensor area, we have embarked on a number of programs to improve our tactical warning and attack assessment capabilities to respond to the increased threat. As an example, the replacement of the 1950's vintage Distant Early Warning System, the DEW line, with the North Warning System (NWS) is nearing completion.

This cooperative program with Canada will substantially improve our capability to detect advanced aircraft and cruise missiles along the northern approaches to North America. Procurement of the last 20 unattended short-range radars is planned for fiscal year 1990, and the North Warning System should achieve full operational capability by 1992.

The new Over the Horizon radar system will warn of an attack by bombers and air-to-surface missiles at all altitudes and at ranges of between 500 and 1,800 nautical miles along the eastern, western, and southern approaches to North America.

A three-sector east coast system providing 180 degrees of radar coverage is in place and undergoing testing. The three-sector west coast system construction is complete and is expected to begin testing in fiscal year 1990. Procurement of two Alaskan sectors is planned for this fall, and procurement of the first of two sectors for the Central Radar System is planned for fiscal year 1991.

To provide improved warning of ballistic missiles, two new PAVE PAWS early warning radars have been deployed, one in Georgia and one in Texas. Together with the PAVE PAWS sites in California and Massachusetts and the perimeter acquisition radar attack characterization system, the PARCS, in North Dakota, they comprise a five-site phased array warning network.

Similarly, the Ballistic Missile Early Warning System, BMEWS, has been improved with upgrades completed at Thule, Greenland, and will be improved further when the upgrades under way at Fylingdales, United Kingdom, are completed.

Space-based warning and assessment of a ballistic missile attack is provided by the Defense Support Program. That system consists

of satellites and ground processing stations capable of detecting and reporting missile launches and nuclear detonations in near real time.

Upgrades, such as satellite-to-satellite laser crosslinks and mobile ground stations are improving the survivability of that system. Improvements to increase detection capability and decrease the vulnerability are also continuing.

In conclusion, it has taken years of effort and a substantial investment of resources to move from where we were in the early 1980s to the much improved posture we enjoy today. However, the comprehensive rebuilding of our strategic C³ capabilities is a broad, long-term undertaking, with the greatest benefits to be realized in the future. While much has been accomplished over the past few years, deficiencies will continue to remain until the current programs are carried through to completion.

What I have described here in a brief way is not a set of new initiatives, but a package of programs begun several years ago that have already demonstrated success and are in their final stages of completion. It is essential that these upgrades and new systems be deployed and become operational, and I ask for your continued support of strategic C³ to ensure that the vital role it plays in maintaining an effective nuclear deterrent is continued.

Mr. Chairman, this concludes our statement. Thank you very much. Admiral Cargill will now discuss the Navy's strategic C³ programs.

[The prepared statement of Dr. Quinn follows:]

OPENING STATEMENT

BY

DR. THOMAS P. QUINN

PRINCIPAL DEPUTY ASSISTANT SECRETARY OF DEFENSE
(COMMAND, CONTROL, COMMUNICATIONS, AND INTELLIGENCE)

I. INTRODUCTION

Mr. Chairman and members of the committee, I appreciate this opportunity to present and discuss the Department of Defense's Command, Control, and Communications, or C3, systems which support our strategic and nuclear deterrence posture. These systems, known as strategic C3, encompass the warning systems and sensors; the command centers; and the ground-based, airborne, and space-based systems needed to ensure connectivity between sensor sites, command center locations, and nuclear capable forces. My testimony today will summarize our accomplishments in improving strategic C3 capabilities and outline our plans for the future, with particular emphasis on the space systems that support the C3 mission.

Survivable and enduring strategic C3 systems strengthen deterrence by reducing the probability that an enemy could destroy our command structure and enhancing our ability to respond and terminate a conflict on favorable terms. Making the costs of an attack exceed any potential gains has been the cornerstone of our deterrence strategy. But, at the beginning of this decade, changes in the threat environment and severe shortcomings in our strategic C3 systems threatened this strategy and jeopardized our ability to maintain a strong nuclear deterrent. Due to their age and vulnerability to attack, there was considerable uncertainty over the ability of many of our strategic C3 systems to survive a nuclear attack. Responding to this situation, the Administration

directed that our strategic C3 capabilities be modernized as an integral part of the Strategic Forces Modernization Program which began in the early 1980's. In fact, the improvement of our strategic C3 capabilities was assigned the highest priority of the overall modernization effort by then President Reagan. Given this directive and carefully guided by a thorough architectural plan, the rebuilding of our strategic C3 systems was accelerated. A guiding objective of the rebuilding was to avoid an overreliance on any one type of system, such as space-based platforms, and to provide the balanced set and range of systems needed for effective strategic C3 capabilities.

An unflinching commitment and strong support from the Congress has moved us closer to the goal of providing robust and reliable strategic C3 systems. The progress which has been attained can be readily seen when you compare where we are today with where we were just a few years ago.

For example, we are strengthening our nuclear deterrent by deploying the Ground Wave Emergency Network, or GWEN. It is a new terrestrial system made up of proliferated, electromagnetic pulse (EMP) hardened radio relay stations and receivers. It is a solution which relies on proven technology to help ensure communications during a nuclear attack. We are also producing Miniature Receive Terminals (MRT's) for installation in our strategic bombers. These will improve communications between our airborne command posts, which can survive an attack, and our strategic bomber force. Similarly, our ability to communicate with the strategic submarine force will improve as the aging EC-130 TACAMO aircraft are replaced with new, more enduring, and higher performing E-6A aircraft. All of these systems are planned to be fully operational in the next few years.

Some long-term solutions to improving the ability of our strategic forces to operate during a nuclear attack will be found in our satellite communications systems. In this regard, the Milstar satellite communications system is one of the most critical of our strategic C3 programs. Using advanced technology, along with survivable ground-based control stations, the system is technically and operationally designed to function through and beyond a major nuclear exchange. As with most complex, advanced technology systems, a long time-frame is required to move from the concept stage to a deployed system. However, considerable progress has been made in developing the Milstar system and, if we stay on our present course, the system will be on-line in the early 90's.

These are only a few examples of the areas where successful solutions were implemented and where progress is continuing. Although much has been accomplished, there have also been disappointments. As fiscal pressures have mounted, so has the necessity to scale back some of our strategic C3 efforts. For example, the GWEN was originally envisioned to consist of over 200 relay stations. Today, that number is down to 96. Also, fiscal constraints forced a reduction in the number of radar coverage sectors planned for the Over-the-Horizon Backscatter (OTH-B) radar system from 12 sectors down to 10 sectors. Nonetheless, the core improvements to the strategic C3 infrastructure which were needed have been or will shortly be realized.

II. STRATEGIC C3 PROGRAMS

Around 30% of the total annual budget for all C3 programs is allocated to strategic C3 and related areas. In January 1989, a request of \$6.3 billion in FY 1990 and \$6.7 billion in FY 1991 for strategic C3 and related programs was submitted to the Congress.

There are no significant funding adjustments to strategic C3 in the amended budget request. Thus, the strategic C3 program has remained strong in spite of the recent reductions to total defense spending. We expect the program to remain viable in the future, given the priority and support which continue to be placed on upgrading the sensor systems that provide attack warning and attack assessment, modernizing the command centers that process warning information and command and control the nuclear forces, and improving the communications systems that provide connectivity between the command centers and the nuclear forces.

When the strategic modernization program began, we relied on radar systems which were built in the 1950's and 1960's to warn of an attack on the U.S.. However, the Soviets expanded and improved their strategic nuclear forces since the time these surveillance systems were originally deployed. In response to this increased threat, we embarked on a number of programs to improve our attack warning and assessment capabilities. These efforts have paid off with the deployment of new sensor systems and improved equipment.

As an example, the replacement of the 1950's vintage Distant Early Warning (DEW) line with the North Warning System (NWS) is continuing and is substantially improving our capability to detect advanced aircraft and cruise missiles along the northern approaches to North America. Procurement of the last 20 unmanned short range radars is planned for FY 1990, and the NWS should achieve full operational capability in FY 1992.

The new OTH-B system will warn of an attack by bombers and air-to-surface missiles at all altitudes at ranges of between 500 and 1800 nautical miles along the eastern, western, and southern approaches to North America. A three sector east coast system providing 180 degrees of radar coverage is in place and undergoing testing. A three sector west coast system is under construction

and is expected to begin testing in FY 1990. Work on the Alaskan Radar System is beginning, and the procurement of the two Alaskan sectors is planned for this fall. Procurement of the first of two sectors for the Central Radar System is planned for FY 1991.

To provide improved warning of ballistic missiles, two new PAVE PAWS early warning radars have been deployed, one in Georgia and one in Texas. Together with the PAVE PAWS sites in California and Massachusetts, and the Perimeter Acquisition Radar Attack Characterization System (PARCS) in North Dakota, they comprise a five site phased array warning network. Similarly, the Ballistic Missile Early Warning System (BMEWS) has been improved with upgrades at Thule, Greenland, and will be improved further when the upgrades under way at Fylingdales, United Kingdom, are completed. We are continuing to test and upgrade these systems in order to ensure that we can counter the Soviet threat.

Spaced-based warning and assessment of a ballistic missile attack is provided by the Defense Support Program (DSP). The system consists of satellites, fixed and mobile ground processing stations, a multipurpose facility, and a ground communications network. It is capable of detecting and reporting missile launches and nuclear detonations in near real time. Upgrades such as satellite-to-satellite laser crosslinks are improving the survivability of the system and additional improvements to increase their detection capabilities and decrease their vulnerability are continuing.

The survivability and capability of the command centers that direct our forces have also been upgraded. As an example, the Military Airlift Command's (MAC) global C2 system has been improved with new data processing equipment, new decision support equipment, and other major command center improvements. We have also reduced the vulnerability of our command posts to EMP

effects. These and other modernization efforts will help ensure the effectiveness of our command centers and support their central role in the control of the strategic forces.

In addition to improving both our attack warning and assessment systems and command centers, we have increased the capacity, survivability, and endurance of our strategic communications systems over the past few years.

Since the Fleet Ballistic Missile (FBM) submarine force is the most survivable leg of the strategic triad, it is essential that we have survivable and enduring communications to and from the strategic submarine force. Connectivity with our submarine forces is being improved with the deployment of the Extremely Low Frequency (ELF) communications system. The ELF system allows continuous contact with submarines while they operate at great depths and, thereby, decreases their vulnerability. Strategic submarine communications will be improved further as we replace current EC-130 TACAMO communications relay aircraft with a new, more capable fleet of E-6A aircraft having considerably greater range.

The Ground Wave Emergency Network (GWEN) is our program for improving strategic connectivity in the Continental United States (CONUS) in the near-term and at relatively low cost. It will provide nuclear hardened, proliferated links to support critical strategic C3 functions. The current 56 ground-based relay node Thin Line Connectivity Capability (TLCC) interconnects command centers, warning sites, and strategic aircraft bases. It is being expanded to 96 nodes so that additional users can be added. The future program also focuses on procuring portable and EC-135C airborne GWEN terminals.

In order to increase their range, resistance to jamming and

nuclear effects, and message accuracy, our very low frequency (VLF)/low frequency (LF) communications capabilities are being upgraded. As a part of this effort, we plan to add VLF/LF Miniature Receive Terminals (MRT's) to B-1B and B-52H aircraft and to continue the development of improved VLF/LF transmission capabilities from EC-135 and E-4B airborne command post aircraft and E-6A TACAMO communications relay aircraft.

While these upgrades and new systems represent a substantial increase in capability, some of the most important communication requirements are satisfied with our satellite systems.

The Defense Satellite Communications System (DSCS) provides super high frequency (SHF) secure voice and high data rate satellite communications in support of worldwide military command and control, crisis management, early warning data relay, and diplomatic traffic. Specifically, it supports the National Command Authorities (NCA), the Diplomatic Telecommunications Service, and the mobile forces of all U.S. services and selected allies. The nominal space segment is comprised of five operational and two on-orbit spare satellites in geosynchronous orbit. Existing DSCS II satellites are continuing to be replaced with more capable DSCS III satellites which carry Single Channel Transponders (SCT's) for nuclear force execution and control. The current program provides for modifications and the acquisition of Integrated Apogee Boost Stages to enable the launch of DSCS III satellites on Atlas II launch vehicles.

The Fleet Satellite Communications (FLTSATCOM) system provides worldwide ultra high frequency (UHF) communications to a variety of mobile users. This includes communications to all Navy ships, submarines, and selected aircraft. The system also satisfies the equatorial satellite communications requirements of the Air Force. The current program supports the acquisition of

new follow-on UHF satellites to replace existing FLTSATCOM satellites as they reach the end of their useful, on-orbit lives.

Of all of our satellite communications systems, the Milstar system is the most critical. It is being developed to meet the need for highly survivable, jam resistant, and secure world-wide communications to support the command and control requirements of the President and military Commanders-in-Chief (CINC's). The development of Milstar satellites is continuing, and the development of terminals for the Milstar system is almost complete. The Army's Single Channel Objective Tactical Terminal (SCOTT) for use in the Milstar system has completed initial testing and will begin full scale production in FY 1990. Low rate initial production of terminals for the Air Force is planned to continue during FY 1990 and FY 1991, and full scale production is planned to begin in FY 1992.

Although not officially categorized as a strategic C3 program, the Navstar Global Positioning System (GPS) will support the management of our strategic nuclear forces by improving our capabilities for navigation, weapons delivery, force control, precision surveys, and many other potential applications. It is a space-based system with worldwide coverage which provides accurate three-dimensional position, velocity, and time information. GPS satellites also carry Nuclear Detonation (NUDET) Detection System (NDS) sensors to detect nuclear detonations. The first production satellite was launched on February 14, 1989. We are continuing to launch additional operational satellites, acquire and integrate user equipment, and continue the development of satellite improvements.

III. CONCLUSION

In conclusion, it has taken years of effort and a substantial investment of resources to move from where we were in the early 1980's to the much improved posture we enjoy today. However, the comprehensive rebuilding of our strategic C3 capabilities is a broad, long-term undertaking with the greatest benefits to be realized in the future. While much has been accomplished over the past few years, deficiencies will continue to remain until the current programs are carried through to completion. What I have described is not a set of new initiatives, but a package of programs that we began several years ago. These programs have demonstrated success and many are in their final stages of completion. It is essential that these upgrades and new systems be deployed and become operational. Strategic C3 has a vital role in maintaining an effective nuclear deterrent, and I ask for your continued support of our strategic C3 and related space programs.

Mr. Chairman, this concludes my statement. Thank you.

Senator EXON. Doctor, thank you very much.

Admiral, before we turn to you, I might call on my good friend and ranking member of the committee, Senator Thurmond, for any opening remarks that he might have. And then I will be glad to recognize Senator Gorton for the same purpose, following Senator Thurmond.

Senator THURMOND. Thank you, Mr. Chairman, I regret I was delayed a little bit.

Mr. Chairman, I join you in welcoming these distinguished witnesses to testify before the subcommittee on the state of U.S. space launch capability and the command, control, and communications network. This subcommittee has been a strong supporter of C³ modernization and of the need for an assured access to space.

The very credibility of our strategic triad rests on a survivable and redundant command, control, and communications. In pursuit of a credible and survivable C³, it is widely recognized that the United States must have the ability to place in orbit space-based components of our C³ network.

This capability to put in space vital communications, surveillance, and reconnaissance satellites is not limited to peacetime operations, but also the stressful conditions of wartime requirements. It is this very capability—survivable communications and assured

access to space—that is the very foundation of our deterrent strategy. We are thankful for the important contribution that the witnesses before us today have in maintaining that capability.

I have been looking forward to this hearing with great interest. Gentlemen, last week General Piotrowski, the Commander-in-Chief of Space Command, testified before this committee in closed session on the net assessment of U.S. space-based control capability. I found the General's presentation impressive, but most disturbing.

The clear Soviet superiority in space control capability—in terms of space launch and anti-satellite capability—poses a direct threat to the credibility of our deterrent strategy and the very survivability of our military forces and C³ assets.

The inability of the United States to guarantee the same degree of assumed access to space as the Soviet Union has today is a particular concern to me and, I believe, this subcommittee. Increased funding for space launch capability will not remedy the existing disparity in space launch capability, however.

From a more fundamental perspective, we must rethink how the United States approaches the problem of launching payloads in space. We must develop ways of launching larger payloads in space, at a much reduced cost, shorter amount of time, and with greater flexibility.

In addition, we should re-examine the way we build satellites to see if they can be produced more efficiently, inexpensively, and are adaptive to a variety of launch vehicles. I hope the witnesses can offer the subcommittee some recommendations as to how we should redress these problems.

Again, I thank the witnesses for their appearance here today, and thank you, Mr. Chairman.

Senator EXON. Thank you very much, Senator.

Senator Gorton.

Senator GORTON. Thank you, Mr. Chairman. I have no opening statement.

Senator EXON. I am pleased to see Chairman Nunn has joined us. Senator Nunn, do you have an opening statement?

Senator NUNN. No, thank you, Mr. Chairman. I have none.

Senator EXON. Thank you.

Admiral, will you please proceed.

**STATEMENT OF REAR ADM. D. BRUCE CARGILL, U.S. NAVY,
DEPUTY DIRECTOR, SPACE, COMMAND AND CONTROL, OFFICE
OF THE CHIEF OF NAVAL OPERATIONS**

Admiral CARGILL. Thank you, sir. Good afternoon, Mr. Chairman and members of the committee.

I am Rear Adm. Bruce Cargill, Deputy Director for Space, Command and Control. I consider it an honor to appear before this committee to represent the Navy's tactical and strategic command and control program.

Mr. Chairman, I request your approval to briefly summarize my official statement and have that statement inserted into the official record.

Senator EXON. Thank you. We have done that, and we would like to have you give us any abbreviated presentation that you would think is appropriate.

Admiral CARGILL. Thank you.

While commanding officer of an aircraft carrier and while commander of our light attack wing in the Pacific, I have experienced first-hand the impact of our command, control and communications programs on fleet operations. I have also had the opportunity to gain considerable perspective on strategic communications and the Navy programs to support national strategic command and control objectives.

I submit that the best way for you to observe the effectiveness of our command, control and communications programs is to visit fleet units and to experience the impact of these programs under operational conditions. I would be most pleased to assist in supporting visits of this nature.

Our maritime strategy is founded on basic national security objectives. This strategy emphasizes deterrence, flexible response, and, if deterrence fails, forward offensive operations. Control of the sea allows us to execute forward offensive operations in defense of Western Europe and in the Pacific.

In conjunction with our allies, our command and control systems must be capable of supporting our naval forces worldwide. Should the conflict escalate from conventional to nuclear war, our systems must be capable of supporting strategic forces under the most stressful situations. Navy command and control programs are structured to provide survivable systems capable of supporting naval warfare across the spectrum of possible conflict from limited crises to nuclear global war.

It is a dynamic process as we seek to improve on existing systems to ensure necessary connectivity.

My written statement provides details on our programs. In these summary remarks, I would like to emphasize our command and control approach to strategic connectivity. Communications will be provided via a combination of shore-based fleet support facilities and fleet satellite systems. [Deleted.]

And since our maritime mission is global in its scope, we rely heavily on space-based systems. The Navy is the largest user of space and space-based systems for strategic forces, and our needs continue to grow. Our global mission and geographic mobility drive us to be the primary users of not only satellite communications, but also of navigation, meteorological, oceanographic, and surveillance systems.

The bulk of the Navy's current communication is now provided by ultra-high-frequency, or UHF, satellite communications systems. However, the present constellation is approaching the end of its expected operational lifetime and must be replaced.

The Navy's number one communications initiative is replacement of this UHFSATCOM capability with a Follow-On replenishment system. Our program has the initial satellites for the Follow-On constellation to be launched beginning in 1992.

This will provide for continued worldwide satellite communications coverage using eight geosynchronous satellites, with one on-

orbit spare. The first satellite of this constellation was funded in fiscal year 1988 and is now under construction.

Our budget request for 1990 includes \$312 million to procure satellites two and three and to provide launch services.

An important aspect of this program is an initiative to add an extremely high frequency, or EHF, capability, beginning with satellite number four. This will supplement the minimum essential wartime communications provided by MILSTAR satellites in a stressful environment. EHF or UHF Follow-On will facilitate the accomplishment of national strategic objectives by providing additional vital anti-jam communications to and from the SSBNs and also to battle force commanders.

This capability will augment the scarce communications resources provided by MILSTAR [deleted]. And in this vein, the Navy fully supports the development of a complete MILSTAR system, [deleted] to provide the fleet worldwide survivable, jam-resistant communications.

In conjunction with the development and fielding of MILSTAR and the Navy EHF package, [deleted].

The communications systems I have described are capable of supporting our naval forces in time of peace, during low-intensity conflicts, such as our operations in the Persian Gulf, or in a global conventional or nuclear war. The Navy has developed a balanced strategic command and control program to support its strategic forces in such a war.

We emphasize meeting the connectivity requirements needed to provide reliable and timely control of our strategic forces. [Deleted.]

To ensure that the messages are received, we rely on redundancy and multiple paths for delivery. [Deleted.]

The worldwide submarine radio broadcast is a highly redundant and overlapping system consisting of very low frequency and low frequency transmitting sites, supported by interconnecting land lines, microwave communications networks, and ultra high frequency satellites. This system provides high volume, multi-channel, long-range communications for management of both fleet ballistic missile and attack submarines in peacetime and for the high volume of retargeting and intelligence information needed during the pre-attack phase of a global conflict.

It provides a highly reliable communications broadcast and report-back system for our submarines at an affordable price.

The drawback to these VLF and LF systems is the need for the submarines to operate at relatively slow speeds with an antenna near the surface to receive communications. This increases the risk of detection of the submarine. [Deleted.]

Now, the extremely low frequency, or ELF, communications system provides a unique capability to communicate with deeply submerged submarines which are at operating speed. [Deleted.]

Development of the Navy's extremely low frequency transmitter system has been completed. The Wisconsin transmitting station achieved initial operating capability in June 1986. A fully operational status for the synchronously linked transmitters in Michigan and Wisconsin will be achieved this year.

Fleet testing is nearly complete, with promising results. Full-scale production of shipboard receivers will begin in November with production of 10 sets per month.

The VLF, LF, and the ELF systems may not be survivable during global nuclear war because they are fixed geographical locations. To ensure delivery of emergency action messages to our strategic forces in the most electronically and physically stressful situations, we have provided for survivable mobile communications for assured connectivity to our fleet ballistic missile submarines during the trans-attack and early post-attack phases of a nuclear war.

The TACAMO aircraft provides a continuous airborne relay and is the key survivable communications node in the Navy's strategic network. Although the turboprop EC-130 Hercules has performed the TACAMO mission well for many years, a replacement aircraft is now needed to meet mission requirements of the 1990s.

The E-6A Hermes, with greater range, payload, speed, and endurance, meets this requirement. A force level of 16 aircraft at a total cost of about \$1.5 billion will provide continuous airborne alert in the Atlantic and Pacific. The first E-6A aircraft will join the fleet this year, and transition from the EC-130 will be completed in early 1991. Operational evaluation and flight training are in progress at this time.

The E-6A will initially be outfitted with the existing communications suite swapped from the EC-130 aircraft. Commencing in 1993, this suite will be upgraded with a more reliable, high powered transmit system, a MILSTAR terminal, a NAVSTAR global positioning system, and a TACAMO message processing system.

The total request for this upgrade program is \$361 million. It will be installed in a carefully planned sequence to ensure no lapse in full airborne alert coverage.

In conclusion, we are designing and fielding systems that respond quickly to increased challenges in our mission and represent the state of the art in modern communications. Positive control is a vital aspect of the deterrent credibility of our nuclear strike forces.

The programs we have developed and for which we seek your continued support meet our requirements today and will serve us well into the future. They represent a balanced and affordable approach in support of national policy and strategic command and control.

Thank you, sir.

[The prepared statement of Admiral Cargill follows:]

STATEMENT OF
REAR ADMIRAL D. BRUCE CARGILL
DEPUTY DIRECTOR
SPACE, COMMAND AND CONTROL (OP-094)

INTRODUCTION

Good morning, Mr. Chairman and members of the committee. It is an honor to testify before this committee in support of the Navy's Space, Command and Control Program. The purpose of my statement today is to provide an overview of the Navy's Strategic and Tactical Command and Control Programs. I will provide you with a broad perspective of how our program meets the requirements of the National Strategy in general and its maritime component in particular.

This is the first opportunity I have had to appear before this committee to testify for Navy Command and Control Programs. I am not a communications specialist, rather a naval aviator. As commanding officer of an aircraft carrier and as commander of our light attack wing in the Pacific, I have experienced first hand the impact of Tactical Command, Control and Communications (C3) Programs on our fleet operations. As an operational commander, I was a user of tactical communications products in the fleet. Throughout my career, I have also had the opportunity to gain considerable first-hand knowledge and experience in the strategic communications arena and in the Navy programs which support national strategic C3 objectives. As the Deputy Director, Space, Command and Control, within OPNAV, I now find that I am in the position of being able to influence and direct strategic and tactical command and control development. I know that in the past several years many members of this committee have visited fleet units and shore activities to become better acquainted with these systems. I encourage the members of this committee to

continue with these visits. I would be most pleased to assist in supporting visits of this nature.

The Maritime Strategy is founded on basic United States' national security objectives. The strategy emphasizes deterrence; flexible response; and, if deterrence fails, forward offensive operations. If a nuclear war is initiated, the strategy requires the United States be able to execute a flexible response and prevail in all phases of a nuclear war to bring the war to a swift conclusion in terms favorable to the United States. During this briefing, I will describe how Navy command and control supports all of the elements of the National Strategy. In the maritime area, a combination of threats drives command and control complexity. First, the Soviet thrust to extend their naval presence to all ocean areas of the world has had a significant impact on how we do business. Second, we live in an era of constant political flux which threatens international order and stability, particularly in the Third World.

To deal with these threats effectively, to maximize the utility of our resources, and to ensure the credibility of our strategic deterrent forces, we require the capability, on a global scale, to exchange critical information and instructions with our naval forces wherever they may be and whenever the need arises.

In the high technology environment of the future, "information warfare" will be as real as any other warfare discipline. Therefore, it is important to place increased emphasis on our command and control systems to ensure that our complex and sophisticated weapon systems can respond to new threats which have increasingly shorter reaction times, lower

detection thresholds, and greater mobility. Several programs are underway in the Navy to manage the timely use of data so that commanders have the connectivity and information they need to employ their ships, submarines, and aircraft effectively. These new command and control systems will fully support our forward battle group commanders as they contend with the threat of the 1990's, while also ensuring interoperability with other U.S. services, with NATO, and with our other Allies.

The Navy's Command and Control Programs are structured to:

- (1) build a more survivable and enduring command and control system capable of supporting our forces across the spectrum of warfare from peacetime and regional crisis situations through global conventional and nuclear war;
- (2) enhance the readiness of our strategic and tactical forces with needed command and control improvements for mobility, interoperability, and sustainability;
- (3) correct existing inadequacies in response to emerging global threats while taking advantage of new technologies; and
- (4) develop new command and control initiatives to improve our existing capabilities, thus effectively meeting our evolving mission needs.

In the remainder of my statement, I will address the Navy's key tactical and strategic command and control systems, special issues of interoperability, space operations, ashore and afloat components of the Navy Command and Control System, and the research and development programs which support future Navy command and control capabilities.

II. TACTICAL

Emphasis on modernization of our tactical command and control systems is a necessary reaction to the growing complexity of the threats we face in the world today. Given the decided

numerical advantage in general purpose forces enjoyed by the Soviet Union, the U.S. policy has been to counter threats by technological superiority and a qualitative edge. New Soviet ships, aircraft, and submarines are the end product of a strong commitment to qualitative improvement. These systems are technologically sophisticated and highly capable. Soviet client states, as geographically separated as Libya, Cuba, and North Korea, have also shown steady qualitative equipment improvements and represent an increased threat as well.

Forward defense is a central element in the maritime component of the National Strategy, and successful battle force operations in the forward areas hinge on effective Anti-Submarine Warfare (ASW). Priority emphasis must, therefore, be placed on necessary command, control, and communications to manage the ASW campaign effectively. More stringent cuing, fusion, and connectivity requirements are being met through upgrades to our worldwide system of operational command centers which provide tactical information to all levels of Navy command. We are also planning replacements and upgrades to improve overall capacity, throughput, and interoperability in and among our afloat command centers.

The Navy is the largest user of space and space-based systems for both tactical and strategic forces; and our interest, role, and dependence upon space and space-based systems continues to grow. Geographic mobility and our worldwide mission drive us to be the primary users of satellites for communication, navigation, meteorology, oceanography, and surveillance systems.

The reliability of communications between both shore-based and afloat commanders and their assigned units through our comprehensive Ultra High Frequency (UHF) satellite communications

system now carries the bulk of the Navy's tactical and intelligence communications. However, this aging system must be replaced in the early 1990's when the current constellation of satellites approaches the end of its expected operational lifetime.

The Navy's number one initiative of the next decade is the Ultra High Frequency (UHF) Follow-On Program. As you know, UHF satellite communications are the bread and butter of the fleet for relay of critical tactical information. The Fleet Satellites and Leased Satellites are aging systems. Based on a study of fuel consumption over the next few years, they will begin to fail with a noticeable degradation in constellation size by 1993.

For this reason, the Navy has planned for a replacement constellation, termed the UHF Follow-On Satellite, to be launched beginning in 1992. UHF Follow-On Satellites will provide worldwide satellite coverage through a constellation of eight geo-synchronous satellites, with an on-orbit spare. The UHF Follow-On Acquisition Strategy is unique in the fact that the contractor assumes the risk of placing the satellite in orbit. Ownership of the satellite will transfer to the government after successful on-orbit testing. This unique acquisition strategy was approved for multi-year funding by Congress in the Fiscal Year 1988 National Defense Authorization Act.

A significant aspect of the program, however, is the initiative by the Navy to add an Extremely High Frequency (EHF) capability to satellites four through nine in the constellation. This initiative will assist in providing the minimum essential wartime communications in a highly stressed environment. This capacity will augment the scarce tactical communications resources provided by Milstar satellites in certain areas. The

Navy is seeking Defense Acquisition Board (DAB) approval of the addition of this vital warfighting requirement. We do not foresee that the addition of EHF capability will alter the multi-year procurement of the UHF Follow-On. Space, weight, and power requirements already exist in the UHF Follow-On spacecraft for the addition of the EHF capability.

The Navy is also pressing forward in the production of Extremely High Frequency (EHF) satellite communications terminals for ship, submarine, and shore-based users. The Navy EHF terminal will be capable of operating with the Milstar communications satellite being developed by the Air Force as part of the Joint Milstar Program. The EHF terminal has recently been approved for Limited Rate Initial Production (LRIP) for production years 1990 and 1991 in a review by the Defense Acquisitions Board. The Navy EHF terminals will be interoperable with the planned EHF package on the Ultra High Frequency Follow-On Satellite. The Navy EHF Satellite Communications Program is an integral part of the Joint Milstar Program. The Navy fully supports the development of the complete Milstar constellation for world-wide coverage in order to provide the fleet with survivable, reliable, jam-resistant strategic and tactical communications under the projected threat environment.

The Navy is also investigating the development of a potential Satellite Laser Communications (SLC) capability for deeply submerged submarines. The benefits of such a capability are recognized. The Navy is working to identify an affordable system option in the face of future budget constraints and immature technology. As we look forward to the future, operating in a prudent fiscal environment, the affordability of full scale engineering developments will necessarily be limited to systems with enhanced operational effectiveness at reasonable costs.

III. STRATEGIC

It is our hope that our maritime strategy will succeed in helping to deter war. Should deterrence fail, we must be prepared to fight and win a global war that has the potential to escalate to the nuclear level. The President has assigned strategic command and control improvements top priority in his Strategic Modernization Program. This priority is reflected in National Security Decision Directives (NSDD) and OSD policy statements such as Defense Guidance. The command and control systems that support our strategic forces must be survivable since they provide the link between employment plans and mission capability. Strategic command and control must be capable of operating under the most severe stress and must be survivable and enduring throughout all phases on nuclear war.

The Navy has developed a balanced Strategic Command and Control Program to support its strategic forces. We emphasize meeting the connectivity requirements needed to provide reliable and timely delivery of emergency action messages. Based on data collected in actual operations over the past 9 years, the reliability of communications to strategic submarine forces has been greater than JCS requirements in an unstressed environment.

The submarine radio broadcast system is a highly redundant and overlapping system of Very Low Frequency (VLF) and Low Frequency (LF) transmitting sites supported by an interconnecting landline, microwave communications network, and UHF satellites. These shore-based broadcast systems provide a reliable communications broadcast and report-back system for our submarines during peacetime operations and during the pre-attack phase of hostilities. This radio broadcast system is the primary communications system used to provide high volume, multi-channel, long-range communications support to all operating submarines,

both attack and fleet ballistic missile capable. It meets all pre-attack connectivity requirements, but is not considered survivable in a global nuclear war. A drawback to the current VLF/LF system is the requirement that the submarine operate with an antenna near the surface. To allow the submarine to use more of its full operational capability while maintaining connectivity, the Navy developed an Extremely Low Frequency (ELF) communications system.

The ELF communications system provides us with a unique capability to communicate with submerged submarines. Its ability to penetrate sea water to hundreds of feet enhances our sea-based nuclear deterrent forces by protecting their assured survivability by allowing routine operations at deeper depths while remaining connected to an alerting ELF signal. This significantly increases communications timeliness by providing the ability to place a submarine "on-call" while still remaining deep which enhances operational flexibility. In other words, with ELF, submarines have the capability to operate continuously at optimum patrol speeds and depths while remaining connected. ELF provides greater operating security to our fleet ballistic missile submarines, thereby adding insurance against any unforeseen Soviet breakthrough in ASW.

Development of the Navy's ELF transmitter system has been completed. The Wisconsin transmitting station achieved Initial Operational Capability (IOC) in June 1986. A fully operational status for the synchronously linked transmitters in Michigan and Wisconsin is expected this year.

Our ELF transmitting facilities, like our radio broadcast sites, are considered vulnerable after the outbreak of hostilities in a global nuclear war. This has necessitated development of alternative, survivable systems for delivery of

Emergency Action Messages (EAMs) during the trans-attack phase and in the post-attack environment.

The TACAMO Program, which provides a continuous airborne relay capability for communications to our strategic fleet ballistic missile submarines, is the key survivable node in the Navy's strategic communications network. The immediate relay capability and the inherent survivability provided by a continuously airborne TACAMO aircraft ensures that our fleet ballistic missile submarines will be able to execute their missions when needed. TACAMO provides clear assurance to the Soviet Union that retribution for any attack cannot be avoided. It is the substantive key to deterrence.

Although the turbo-prop EC-130 has performed the TACAMO mission well in the past, a replacement aircraft is required to meet the mission requirements of the 1990's. As a replacement for the EC-130 TACAMO airframe, the E-6A, with greater range, payload, speed, and endurance meets these requirements. The E-6A Program has been tailored to reduce acquisition time and cost with minimal risk. The E-6A engineering design is derived from the mature and proven Boeing 707/E-3 airframe, using commercial CFM-56 engines and incorporating existing mission communications equipment with pre-planned product improvements.

The TACAMO communications system VLF downlink to the SSBNs is being upgraded with a more reliable High Power Transmit System (HPTS) in a joint development program with the Air Force. HPTS will be installed on the E-6A and on the Air Force EC-135 airborne command posts. The E-6A aircraft will also be backfitted with a Milstar EHF terminal, a NAVSTAR Global Positioning System Terminal, and the TACAMO Message Processing System (TMPS) upgrade.

IV. CONCLUSION

The achievement of a comprehensive and integrated command and control system is necessary to implement the national policy of deterrence and the maritime portion of the National Strategy. Modern, maintainable, and sustainable command and control systems that are capable of surviving and enduring across the full spectrum of conflict are essential to the successful employment of our weapons systems.

As demonstrated by recent events in the Persian Gulf, one of the Navy's greatest strengths is mobility. This advantage is perhaps even more important today than at any other time in our history. The ability to conduct sustained global, forward deployed operations, whenever and however they are needed, and without the consent or cooperation of any foreign government, provides the United States a responsiveness to changing international conditions unmatched by any other country. This flexibility, however, places significant demands on our command and control systems. Unable and unwilling to rely entirely on major fixed sites and nodes, we are designing and fielding systems that respond quickly to changes in our missions. Our priority is on providing a system that will be able to assure connectivity to our forces in all potential warfare environments. The program we have in place employing fixed broadcasting facilities with VLF/LF, ELF and HF transmitters, UHF satellites, and TACAMO aircraft is being upgraded in an evolutionary manner with new satellite constellations and newer aircraft replacing aging obsolete systems. Ours is a carefully thought out program that seeks to strike a balance between fiscal restraints and operational requirements.

We greatly appreciate your continued strong support of the Navy's Tactical and Strategic Command and Control Programs.

Senator EXON. Thank you very much, Admiral.

Who wishes to go next?

Doctor, we are pleased to recognize you. Please proceed.

STATEMENT OF DR. GEORGE R. SCHNEITER, ACTING DEPUTY DIRECTOR, DEFENSE RESEARCH AND ENGINEERING FOR STRATEGIC AND THEATER NUCLEAR FORCES

Dr. SCHNEITER. Thank you.

I am George Schneider, Acting Deputy Director for Defense Research and Engineering for Strategic and Theater Nuclear Forces.

I am pleased to be here with General Moorman to discuss our space launch capabilities and plans. I propose to say a few words on policy. General Moorman will then describe the status of our launch programs and current plans.

The basis for the current Department of Defense space launch acquisition strategy is the national space policy, approved by the President on January 5, 1988. This policy gave new direction to the topic of assured access to space and validated the space launch recovery program begun by the DOD in the aftermath of the Challenger accident and other expendable launch vehicle failures.

The principal objectives of our space transportation systems are to provide for a balanced, robust, and flexible capability with sufficient resiliency to allow continued operations despite failures in any one system. We want to achieve and maintain safe and reliable access to, transportation in, and return from space; exploit the unique attributes of manned and unmanned launch and recovery systems; encourage, to the extent feasible, the development and use of U.S. private sector space transportation capabilities without direct Federal subsidy; and, reduce the costs of space transportation and related services.

DOD's launch recovery program fully supports these national policy goals.

I would now like to turn the floor over to General Moorman, who will discuss our current programs and plans.

[The prepared statement of Dr. Schneider follows:]

TESTIMONY

BY

DR. GEORGE R. SCHNEITER

DEPUTY DIRECTOR, DEFENSE RESEARCH AND ENGINEERING

THE BASIS FOR THE CURRENT DEPARTMENT OF DEFENSE SPACE LAUNCH ACQUISITION STRATEGY IS THE NATIONAL SPACE POLICY, APPROVED BY THE PRESIDENT ON JANUARY 5, 1988. THIS POLICY GAVE NEW DIRECTION TO THE TOPIC OF ASSURED ACCESS TO SPACE AND "VALIDATED" THE SPACE LAUNCH RECOVERY PROGRAM BEGUN BY THE DOD IN THE AFTERMATH OF THE CHALLENGER ACCIDENT AND OTHER EXPENDABLE LAUNCH VEHICLE FAILURES.

THE GOALS OF THE UNITED STATES SPACE TRANSPORTATION SYSTEMS ARE TO PROVIDE FOR A BALANCED, ROBUST, AND FLEXIBLE CAPABILITY WITH SUFFICIENT RESILIENCY TO ALLOW CONTINUED OPERATIONS DESPITE FAILURES IN ANY ONE SYSTEM. THESE GOALS ARE: (1) TO ACHIEVE AND MAINTAIN SAFE AND RELIABLE ACCESS TO, TRANSPORTATION IN, AND RETURN FROM SPACE; (2) TO EXPLOIT THE UNIQUE ATTRIBUTES OF MANNED AND UNMANNED LAUNCH AND RECOVERY SYSTEMS; (3) TO ENCOURAGE, TO THE MAXIMUM EXTENT FEASIBLE, THE DEVELOPMENT AND USE OF US PRIVATE SECTOR SPACE TRANSPORTATION CAPABILITIES WITHOUT DIRECT FEDERAL SUBSIDY - HERE I MIGHT ADD THAT WE ARE DOING MORE THAN ENCOURAGING; WE HAVE CONTRACTED FOR PRIVATE SECTOR CAPABILITIES IN TWO AREAS - THE PEGASUS AND THE NAVY'S UHF FOLLOW-ON PROGRAM; AND, (4) TO REDUCE THE COSTS OF SPACE TRANSPORTATION AND RELATED SERVICES.

RELATED TO THESE NATIONAL POLICY GOALS IS DOD'S LAUNCH RECOVERY PROGRAM, WHICH IS HOW WE ARE IMPLEMENTING NATIONAL POLICY IN THE NEAR-TERM. TO MEET THE GOAL OF ASSURED ACCESS, THE DOD IS RELYING ON A MIX OF ROBUST SATELLITE CONTROL, ASSURED ACCESS TO SPACE, ON-ORBIT SPARING (NOT IN THE CONTEXT OF EXTRA SATELLITES BUT MORE AS A WAY TO ENSURE MISSION CAPABILITY),

PROLIFERATION, RECONSTITUTION, OR OTHER APPROACHES NOT REQUIRING SPACE SYSTEMS - IF THESE ARE MORE COST-EFFECTIVE.

IN THE MID- AND FAR-TERM THE DEPARTMENT IS IMPLEMENTING AND INVESTIGATING A NUMBER OF OTHER OPTIONS THAT ARE NOT NECESSARILY RESTRICTED BY OUR NEAR-TERM STRATEGY. I WOULD NOW LIKE TO HIGHLIGHT A FEW EFFORTS WITHIN DOD THAT RELATE TO THE OVERALL LAUNCH STRATEGY. THE FIRST EFFORT DEALT WITH A 1988 DEFENSE SCIENCE BOARD STUDY ON ASSURED MILITARY USE OF SPACE. ALTHOUGH THIS EFFORT FOCUSED PRINCIPALLY ON SUPPORT TO THE OPERATIONAL COMMANDER, THE TASK FORCE DID IDENTIFY A NUMBER OF RECOMMENDATIONS REGARDING LAUNCH. THESE WERE:

- THAT THE CURRENT STABLE OF LAUNCH VEHICLES CAN, AND AS A PRACTICAL MATTER MUST, SERVE AS OUR BASELINE CAPABILITY FOR AT LEAST THE NEXT TEN YEARS. THIS IS LONG ENOUGH TO PERMIT AND JUSTIFY SUBSTANTIAL, EVOLUTIONARY IMPROVEMENTS FOR OPERATIONS, RELIABILITY, AND LOWER COSTS.

- THAT THE SHUTTLE USE BY DOD SHOULD BE RESTRICTED TO ONLY THOSE CASES WHERE MAN'S PRESENCE IS NEEDED OR WHERE PRACTICALITIES OF PAYLOAD COST AND PAYLOAD SCHEDULE DEMAND ITS USE - NOT DIFFERENT I MIGHT ADD THAN WHAT OUR STRATEGY IS TODAY.

- THAT THE ADVANCED LAUNCH SYSTEM TECHNOLOGY PROGRAM GOALS OF COST REDUCTION AND COMPONENT RELIABILITY SHOULD BE PURSUED, AND THAT, IN THE LONG TERM, THE ALS PROGRAM COULD PROVIDE THE BASIS FOR A FAMILY OF NEW VEHICLES WITH LOWER COST AND BETTER AVAILABILITY.

IN DISCUSSING THE ASSURED ACCESS TO SPACE AND ASSURED MISSION CAPABILITY SUBJECTS, THE TASK FORCE IDENTIFIED AS A POSSIBLE SOLUTION A LAUNCH STRATEGY OF "LAUNCH ON SCHEDULE" AS

THE PRIMARY STRATEGY. THIS WOULD REQUIRE THAT WE PLAN FOR LAUNCHING ON A SPECIFIED SCHEDULE INDEPENDENT OF ON-ORBIT SATELLITE FAILURES. THE RESULT IS THAT WE BUILD UP AN INHERENT ON-ORBIT ROBUST CAPABILITY IN SPACE THAT WOULD OFFSET ANY PREMATURE FAILURE, THEREBY AVOIDING REDUCED MISSION CAPABILITY AND THE NEED TO DEVELOP A QUICK GROUND-BASED RECONSTITUTION CAPABILITY. THIS STRATEGY WOULD ALLOW US TO HAVE A CONSTELLATION THAT DEGRADES GRACEFULLY, WHEREBY OTHER LAUNCH STRATEGIES COULD BE EMPLOYED. THE TASK FORCE ALSO RECOMMENDED THE DEVELOPMENT OF A SURVIVABLE LAUNCH CAPABILITY PRINCIPALLY FOR USE IN CRISIS SITUATIONS. THESE LAUNCHERS WOULD BE USED TO LAUNCH SMALLER SPACECRAFT NECESSARY TO FULFILL PRIORITY MISSIONS IN STATES OF STRESS AND NUCLEAR WAR. THESE SURVIVABLE LAUNCHERS SHOULD USE SIMILAR SURVIVABILITY FEATURES AS THE US STRATEGIC FORCES, AND IF POSSIBLE, THE SAME BASIC ROCKETS AND LAUNCH FACILITIES.

ANOTHER ACTIVITY THAT WE HAVE UNDERTAKEN IS RELATED TO THE QUESTION OF THE MOST COST-EFFECTIVE LAUNCH STRATEGY FOR A STRATEGIC DEFENSE SYSTEM. THE FIRST PART OF A TWO PART STUDY HAS RECENTLY BEEN COMPLETED. THE PRELIMINARY RESULTS ARE THAT THERE ARE A NUMBER OF COST-EFFECTIVE OPTIONS; HOWEVER, THEY APPEAR TO BE CLASSED IN EITHER A MEDIUM LAUNCH VEHICLE CLASS OR A TITAN III/IV CLASS. THIS REFLECTS THE UNCERTAINTY OF THE SDS MISSION MODEL, AND, THE RESULTS ARE A STRONG FUNCTION OF WHETHER ONE ASSUMES THAT A PHASE II SDS DEPLOYMENT NATURALLY WOULD FOLLOW A PHASE I DEPLOYMENT. IN THAT CASE, THE PREFERRED APPROACH WOULD BE THE ALS. WE ARE NOT YET READY TO MAKE ANY ACQUISITION DECISIONS BASED ON THIS INFORMATION. WE WILL SPEND THE NEXT FEW MONTHS REFINING THE OPTIONS AS THE SDS MODEL BECOMES BETTER DEFINED, AND PUTTING MORE RIGOR INTO THE COSTING METHODOLOGY.

A THIRD ACTIVITY DEALS WITH THE ALS PROGRAM. AS YOU KNOW, WE COMPLETED A DEFENSE ACQUISITION BOARD MILESTONE I REVIEW LAST NOVEMBER. THE SECRETARY OF DEFENSE DECISION ON THAT PROGRAM WAS TO FUND THE TECHNOLOGY PORTION OF THE PROGRAM THROUGH THE FYDP

AND TO PLAN FOR A MILESTONE II REVIEW IN THE SPRING OF 1990. ACTIVITIES ARE PROCEEDING TO SUPPORT THAT REVIEW AND, WITH THE RESULTS OF THE SDS LAUNCH STUDY I DISCUSSED EARLIER, WE HOPE TO HAVE A BETTER PICTURE OF THE SCHEDULE, SIZE, AND FACILITY REQUIREMENTS FOR AN ALS. WE MAY WELL WANT TO FIELD SOME MEMBER OF THE ALS FAMILY AROUND THE TURN OF THE CENTURY, INDEPENDENT OF AN SDS DEPLOYMENT.

THE LAST ACTIVITY I WOULD LIKE TO DISCUSS IS THE RECENTLY CONVENED DSB SUMMER STUDY ON NATIONAL SECURITY LAUNCH STRATEGY. THE PURPOSE FOR CONVENING THIS GROUP WAS TWOFOLD: TO RESPOND TO THE CONGRESSIONAL DIRECTION IN THE FY 1989 AUTHORIZATION BILL, AND TO REVIEW DOD'S SPACE LAUNCH STRATEGY IN SUPPORT OF NATIONAL POLICY. SOME KEY QUESTIONS WE HAVE ASKED THE GROUP TO ADDRESS INCLUDE:

- "HAVE WE IMPLEMENTED THE NATIONAL AND DOD POLICY REGARDING SPACE LAUNCH?" AS YOU RECALL, THIS POLICY ENUMERATED SUCH THINGS AS ASSURED ACCESS, DUAL CAPABILITY, AND RELIABILITY. HOWEVER, WE STILL HAVE A NUMBER OF SINGLE POINT FAILURE MODES IN OUR SPACE LAUNCH CAPABILITY, AND WE STILL HAVE NOT ADDRESSED THE ISSUE OF FLEXIBILITY OR RESPONSIVENESS. ALTHOUGH I WOULD NOT SUGGEST WE MIRROR THE SOVIET LAUNCH SYSTEM, IT DOES OFFER A NUMBER OF ADVANTAGES OVER THE US SYSTEM, ESPECIALLY IN FLEXIBILITY, RESPONSIVENESS, AND RECOVERY FROM FAILURE. THEIR SYSTEM IS GEARED TO SUPPORT A WAR-FIGHTING NEED WHEREAS OURS IS PRIMARILY A PEACETIME CAPABILITY. THIS I REFERRED TO EARLIER IN DISCUSSING THE 1988 DSB SUMMER STUDY FINDINGS AND RECOMMENDATIONS.

- "SHOULD THE DOD SHOULD RELY ON BUSINESS AS USUAL (DEVELOPING/PROCURING LAUNCH VEHICLES) VERSUS

PURCHASING A COMMERCIAL SERVICE?"

- "HOW DO WE DEAL WITH THE RECOMMENDATION OF LAST YEAR'S DSB FOR A SURVIVABLE, RESPONSIVE LAUNCH SYSTEM; THE FUTURE DECISION PROCESS FOR AN ALS; AND IMPROVEMENTS TO THE CURRENT FLEET, GIVEN BUDGET REALITIES?"

THE DSB EXPECTS TO COMPLETE THIS REVIEW IN AUGUST, AND AFTER REVIEW BY THE SECRETARY OF DEFENSE WE WOULD BE PLEASED TO PROVIDE YOU A COPY OF THIS REPORT. TO ADDRESS YOUR CONCERNS LISTED IN THE FY 1989 AUTHORIZATION BILL LANGUAGE, WE HAVE PREPARED AN INTERIM RESPONSE, WHICH HAS BEEN REVIEWED BY THE DSB TASK FORCE AND CONSTITUTES THEIR INTERIM AND TENTATIVE OBSERVATIONS. THIS RESPONSE SHOULD BE PROVIDED SHORTLY.

AS YOU CAN SEE, THE QUESTION OF WHAT OUR SPACE LAUNCH ACQUISITION STRATEGY SHOULD BE IS CLEARLY AN IMPORTANT CONSIDERATION WITHIN THE DOD.

THIS CONCLUDES MY FORMAL COMMENTS. I WOULD BE HAPPY TO RESPOND TO YOUR QUESTIONS.

Senator EXON. Dr. Schneider, thank you very much.
General Moorman.

STATEMENT OF MAJ. GEN. THOMAS S. MOORMAN, JR., U.S. AIR FORCE, DIRECTOR OF SDI AND SPACE PROGRAMS, OFFICE OF THE ASSISTANT SECRETARY OF THE AIR FORCE FOR ACQUISITION

General MOORMAN. Good afternoon, Mr. Chairman. I am General Tom Moorman, the Director of Space and SDI Programs under the Assistant Secretary of the Air Force for Acquisition.

I have a statement that I have submitted for the record, sir.

Senator EXON. We have already accepted that.

General MOORMAN. Thank you, sir.

My topic today is space launch. It is extremely important to discuss that subject with you, for two reasons primarily.

The first is that it has been over a year since Mr. Aldridge was in speaking to the Congress on the space launch, and specifically this committee, and we owe you an update on that, particularly in view of the support that we have gotten from this committee for the assured access program and the space launch recovery.

The second one is perhaps even a little bit more current, and those are the statements that were made by General Piotrowski in his hearings as to some of the concerns he has with our current space launch posture and where we are going.

If I may, I would like to address those in a formal briefing to you and try to give you an idea of how the Defense Department is dealing with some of those shortfalls that General Piotrowski identified.

With that, could I have the first slide, please.



LAUNCH VEHICLE STRATEGY

- INITIAL RECOVERY (FY 86 THROUGH PRESENT)

- USE THE SHUTTLE AND RESIDUAL ASSETS TO RESTORE NATIONAL ACCESS TO SPACE

- MIDTERM (PRESENT THROUGH LATE 1990s)

- FIELD A NEW FAMILY OF LAUNCH VEHICLES TO REDUCE THE RISK OF ANOTHER EXTENDED LAUNCH "STANDDOWN" AND BETTER MEET THE OBJECTIVES OF ASSURED ACCESS, RESPONSIVENESS, AND AFFORDABILITY

- FAR TERM (LATE 1990s THROUGH 2020+)

- DESIGN A LAUNCH SYSTEM TO SATISFY THE OBJECTIVES OF ASSURED ACCESS, RESPONSIVENESS, AND AFFORDABILITY AND PROVIDE THE SUPPORT STRUCTURE FOR A SPACEFARING NATION

Senator EXON. General, I understood you to say that you wished to address that. Do you mean in some separate hearing?

General MOORMAN. No, sir; in the course of this briefing.

Senator EXON. Right now?

General MOORMAN. Describing some of the programs.

Senator EXON. That is good. Thank you.

General MOORMAN. Yes, sir.

Senator EXON. We are anxious to hear that.

General MOORMAN. The Defense Department's launch vehicle strategy can really be described in three phases. The first phase was the initial recovery, the recovery from the Challenger and Titan accidents. Mr. Chairman, we are indeed through that period, and we were able to get through that period with the support from the Congress and really a national effort.

I am going to talk about some of the highlights which are characterized in the subsequent slides. We are now currently in what I would now characterize the midterm, and that midterm runs through the late 1990s. This is characterized by fielding a new family of vehicles, they are the Titan IV, the Atlas II, the Delta IIs, and the Titan II.

However, all those vehicles are based upon existent technology and existing processes, and I will come back to that theme.

What that has allowed us to do is lower the risk of an extended down time and better meet the objectives of an assured access, responsiveness, and affordability. But, as General Piotrowski points out, we are not there yet to meet the needs of the war-fighting CINCs.

To really work that problem, we have to be in our third phase of the strategy, or the far term, and that begins in funding with the advanced launch system in this year's budget. But we would not be able to field a capability until the end of the nineties, but that capability would lead us well into the next century.

And what that is designed to do is to work with assured access, responsiveness, and affordable, and provide us that kind of infrastructure that this country needs. And I will take some time on that.



SPACE LAUNCH RECOVERY

- REESTABLISHED ABILITY TO PLACE DOD SATELLITES IN ORBIT
 - TITAN 34D LAUNCHES: OCT 87, NOV 87, SEP 88, NOV 88, MAY 89
 - TITAN II FIRST LAUNCH: SEP 88
 - DELTA II FIRST LAUNCH: FEB 89
 - TITAN IV ILC: FEB 89
- ESTABLISHED CONTINUING ELV LAUNCH INFRASTRUCTURE
 - TITAN IV MULTIYEAR PRODUCTION CONTRACT
 - TITAN IV LAUNCH FACILITIES ON BOTH COASTS
 - MLV I (DELTA II) AND MLV II (ATLAS II) PRODUCTION AND LAUNCH INFRASTRUCTURE

THE RECOVERY PROGRAM IS IN PLACE TO RESTORE A ROBUST
LAUNCH CAPABILITY
"BACKLOG" WILL BE FLOWN OUT BY 1992-93

Let me speak a little bit to space launch recovery very quickly. The Titan 34 vehicles are the two vehicles we had accidents with, in August 1985 and April 1986. In the recovery we have had five successful launches. One more vehicle remains to be flown. We will fly that late July. It [deleted].

We have launched the refurbished Titan II with a classified payload in September 1988. The Delta II, made by McDonnell Douglas, one of the new classes of vehicles, was launched on Valentine's Day with the first operational Global Positioning System.

The Titan IV had an initial launch capability in February 1989. However, as you may recall, we have not launched that yet. We postponed the launch of the Titan IV because we did not have suf-

ficient crews nor equipment for the inertial upper stage vehicle to share with NASA, and as a consequence, to keep NASA's Magellan payload on schedule, we deferred the launch of the first Titan IV.

Now, I am happy to relate that we are planning on launching that on the 10th of June, give or take a couple of days. We have had several delays, but this is a new satellite as well as a new booster program. We want to have it just right.

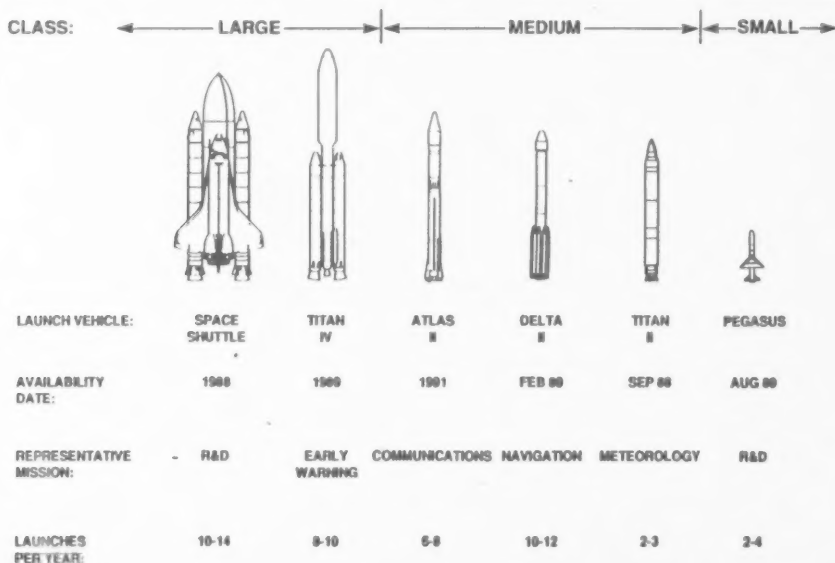
We have also established a continuing ELV launch infrastructure. We are buying very large lots of Titan IV on a multi-year contract. We have under contract currently 23 birds. [Deleted.]

We have built two Titan IV facilities, or are in the process of building, I should say, one on each coast. And we are buying 20 Delta IIs and 10 Atlas IIs. So we do have a lot of flexibility on launch capability.

As you may recall from Mr. Aldridge's briefings to you, the Challenger and the Titan resulted in a fairly substantial—accidents, resulted in a large backlog, about 25 satellites. We will not fly that off until about the end of 1992.



MIDTERM LAUNCH VEHICLES (1991 AND BEYOND)



Here is that fleet of midterm launch vehicles that the Defense Department has and that will be used. The Space Shuttle, we have some eight credits still to be flown off on the Space Shuttle. After we fly that off, we will fly SDI payloads and R&D payloads.

The capacity for all four Orbiters is somewhere between 10 and 14 a year.

The Titan IV for our classified [deleted] satellites, as well as our very important MILSTAR and DSP goes on the Titan IV, flying about 8 to 10 a year. Atlas II, somewhere between 6 and 8, and we will fly with Atlas II the DSCS communications satellite, and commercial users as well.

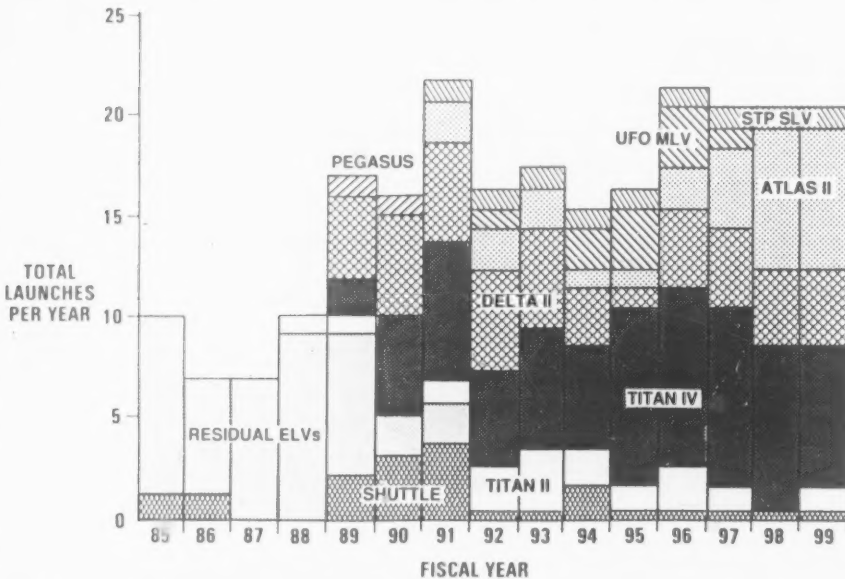
Delta flies the NAVSTAR Global Positioning System or navigation system. Titan II will fly the meteorological satellite or DMSP.

And then finally a new development which deals to a degree with what General Piotrowski is concerned about, that is launching small payloads quickly, a very innovative approach to that by American industry called Pegasus, wherein you sling a little rocket on a B-52, and it allows you to put about 600 pounds to low earth orbit—ideally suited to UHF communications satellites.



PROJECTED DOD LAUNCH MISSION MODEL

(AS OF MAY 89)



Mr. Chairman, you may recall again when Mr. Aldridge briefed you, he briefed you on a chart like this, before and after. The chart back before 1985 and 1986 showed that we were virtually going to a complete dependency on the Space Shuttle.

With the Challenger accident, we have moved sharply away from that to a mixed fleet. The message in this chart by all of the slashes and solids and dots is that we indeed have a mixed fleet with a lot of different kinds of systems to get us to orbit.

Another message is that we will launch, beginning in about 1991-92 time frame, about 20 launches a year, and in the out years that kind of levels out at that level.



CURRENT SYSTEM SHORTFALLS

LAUNCH RESPONSIVENESS	120 DAYS BETWEEN LAUNCHES (3 LAUNCHES PER PAD PER YEAR)
COST (POUNDS TO ORBIT)	>\$3,000 PER POUND
LAUNCH CREW SIZE	SEVERAL HUNDRED TECHNICIANS
PAYLOAD TO GEOSYNCHRONOUS ORBIT	10,500 POUNDS
PAYLOAD/VEHICLE INTEGRATION	CUSTOMIZED FOR EACH PAYLOAD
AGE OF TECHNOLOGY	1960s VINTAGE

(DATA BASED ON TITAN IV ELV)

This chart really reinforces what General Piotrowski said to you, that, as proud as we are with our recovery, with the new systems and the performance of those new systems, they still represent 1960s technology and they have some shortcomings.

Some of the shortcomings that General Piotrowski alluded to, and I will give you my perspective on them—is launch responsiveness. If you take the Titan IV, which all of these are examples of because it is our most complex, nominally it takes us about 120 days to launch. We are trying to drive that down, but we will only be able to do that on the margin. We will not make a dramatic increase in the turn-around time on Titan launches.

Cost to orbit. Using the Titan example, it costs you approximately \$3,600 per pound to low earth orbit for the Titan. Frankly, that is too expensive for space transportation. We have to drive that down.

Launch crew size in the case of the Titan is about 300 to 400 people; in the case of the other booster programs I talked to you about, about 120 to 150. Not only is that a lot of people, but they are also highly trained technicians.

We need to drive down that number as well.

This is our capacity: 10,500 pounds to geosynchronous. The country needs a heavy lift capability. If we ever go to a phase two SDI, we will certainly need that. There are payloads on the drawing board that are well beyond that and we need to look to that.

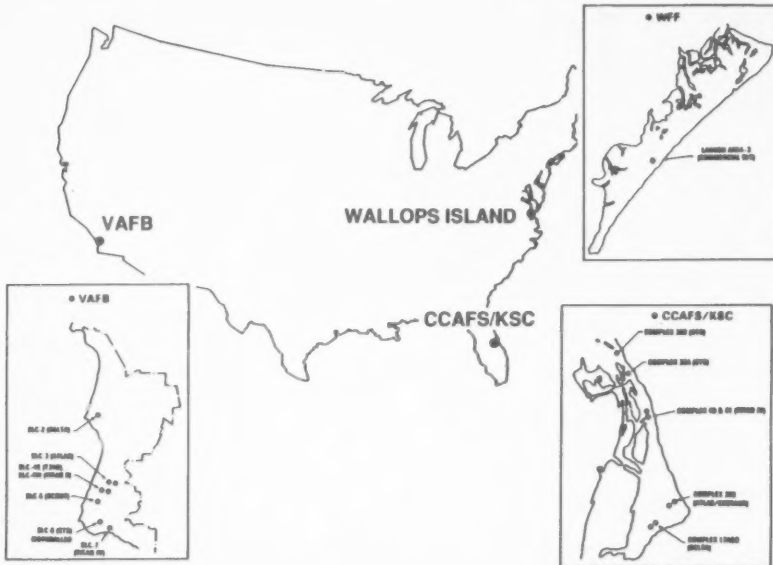
Also, each payload and each booster are customized. That is, we develop the booster along with the payload, and each one is unique.

That requires an awful lot of intensive engineering effort. We need to have more common boosters.

And finally, as I mentioned to you, this is the 1960s vintage. If you are talking aircraft, you would say we are going into space now with the equivalent in the fighter technology of the century series fighter. We are basically flying the same thing that we flew in the early sixties, albeit upgraded, but the same basic technology.



U.S. SPACE LAUNCH CENTERS



Let us talk a little bit about launch facilities and launch centers. We have two primary launch centers, Cape Canaveral and Vandenberg. I will not go into each one of the launch sites, but there are a total of 13. There are another four under consideration for modification.

This is Wallop's Island that NASA runs, and they launch Scout rockets as well as sounding rockets.



VANDENBERG AFB SECOND TITAN IV LAUNCH COMPLEX

- **DOD LAUNCH NEEDS:**

- CAPACITY TO MEET 1996 AND BEYOND REQUIREMENTS
- CAPABILITY FOR HEAVY LIFT (CENTAUR) TO HIGH-ALTITUDE, HIGH-INCLINATION ORBITS
- RESILIENCY AGAINST LAUNCH PAD ACCIDENTS

A CRITICAL ELEMENT FOR ASSURED ACCESS TO SPACE

The big issue or the primary issue that we will be coming to the Congress with later this fall is the issue of what to do about launch capacity for the Titan IV. That subject can be summarized around the subject Space Launch Complex 6, which is currently the shuttle pad at Vandenberg, versus a new pad, space launch Complex 7.

The reason we need that, sir, is that—I mentioned to you that in the 1995-1996 time frame we are going to be launching 8 to 10 Titans a year. We just do not have the capacity to launch those in that rate, and the needs demand that kind of a launch rate.

The other thing, and a very big long pole in processing things, is the upper stage, the liquid Centaur. We need Centaur capabilities at all our launch centers.

And then finally, and graphically underscored in the Titan-34 accidents—the one in April, you may recall that went up and then blew up within a distance of the adjoining pad. It damaged one of the adjoining pads. We need the insurance against that happening again. We cannot afford for our launch pads to be down like those.



DOD SPACE LAUNCH FUNDING

(THEN-YEAR MILLIONS OF DOLLARS)

PROGRAM	(PRODUCTION FYDP/TOTAL TO 94)	FISCAL YEAR						TOTAL
		89	90	91	92	93	94	
STS/IUS		289	294	287	240	319	295	1,724
TITAN IV	(9/17)	853	881	554	632	686	582	4,169
TITAN II	(0/6)	35	38	47	49	53	54	276
ATLAS II	(7/9)	133	100	104	73	66	69	545
DELTA II	(13/33)	211	136	177	171	131	199	1,025
ATLAS E	(0/8)*	36	15	15				66
FOURTH TITAN IV PAD			33	50	100	219	127	537
ALS AF		0	99	99	99	124	150	571
SDIO		150	100	125	150	175	185	885
TOTAL		1,707	1,696	1,458	1,522	1,773	1,641	9,797

* 8 REMAINING FROM THOSE MODIFIED FROM ICBM

Here is the funding profile. I do not know whether that is real clear to you. Basically, this is the 6-year period 1989 through the end of the FYDP, nominally spending about \$10 billion for transportation in space. It ends up being nominally about 20 percent of the Air Force's space budget.

Here is the money for an additional Titan IV pad, \$537 million in the FYDP. However, that only pays for the SLC-6 option, the modifying the shuttle pad. The Air Force is studying that issue and will make a decision as to whether we are going to go SLC-6 or SLC-7 and bring that forward.



FAR-TERM STRATEGY

- LAUNCH CONCEPTS FOR "EXISTING" PAYLOADS (e.g., DSP, GPS, BSTS, etc.) ARE NOT LIKELY TO CHANGE BEFORE THE LATE 1990s, DUE TO THE LEAD TIME TO CHANGE THE PAYLOAD-VEHICLE INTERFACE
- THE NATIONAL SECURITY OBJECTIVES (ASSURED ACCESS, RESPONSIVENESS, AFFORDABILITY) CANNOT BE ACHIEVED THROUGH SIMPLE EVOLUTION OF TODAY'S STS/ELV SYSTEMS

THEREFORE

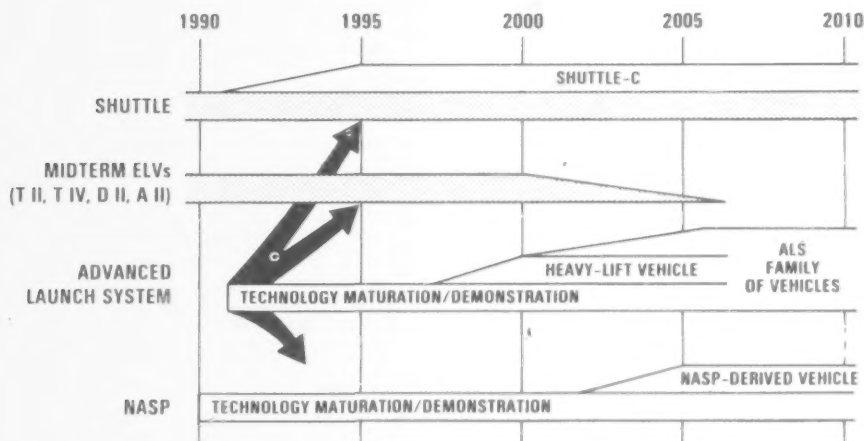
- THE "FUTURE" LAUNCH SYSTEM PLANNING SHOULD BE BASED ON A GRADUAL IMPLEMENTATION OF A FAMILY OF LAUNCH VEHICLES

That brings us to the far-term strategy, and the reason it is characterized as far-term and does not come into play until the late 1990s is that launch concepts for the payloads that we now know of, the DSP, BSTS, and those classes, are pretty much locked into concrete, that match of the booster and the payload. We cannot make a wholesale change to that until the late nineties.

The other reason for the far-term is that we cannot evolve the Titan, the Atlas, the Delta class to realize the things that General Piotrowski is talking about or the cost savings that we all desire in our launch systems. What that tells you, therefore, is you need a clean sheet of paper, and that is a gradual implementation of a family of new vehicles based upon 1980s technologies, rather than 1960s.



MID 1990s AND BEYOND LAUNCH SYSTEMS OPTIONS



Here is what the road map looks like, if you will. Let us start with the midterm ELVs, again the Titans, Deltas, and Atlases. And the thing I want to point out is we are going to probably fly those until some time out to the year 2005.

We are also going to be flying the fleet of the Shuttle out in that time frame. The Air Force's answer to some of the concerns that General Piotrowski has is the Advanced Launch System program, and in the near term we are spending \$200 to \$250 million of technology between NASA and ourselves, and we are spinning that technology off into the Shuttle program, into ELVs, and applying that as well to the NASA program—ways to improve the process, ways to improve the lightweighting of engines and lightweighting of structures.

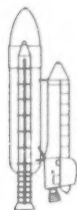
We already see contractors coming back in proposing ALS technologies in their engineering change proposals.

The ALS, if a decision were made in the 1992 time frame, the earliest you could get a capability is in 1998. It originally was de-

signed to support an SDI deployment. I am going to explain to you that the applications of the Advanced Launch System are far greater than that.



FUTURE LAUNCH SYSTEM CHARACTERISTICS



SHUTTLE-C

- EXISTING STS COMPONENTS, REPLACES ORBITER WITH NEW CARGO ELEMENT
- CAPACITY—1 FLIGHTS PER YEAR
- RESPONSIVENESS LIKE STS
 - STS PROCESSING, INTEGRATION, AND FACILITIES
 - LAUNCH CALLUP —180 DAYS



ALS

- CLEAN SHEET APPROACH
- FLEXIBLE CAPACITY (10,000-450,000 LB)
 - MODULAR FACILITIES
- SIGNIFICANTLY IMPROVED RESPONSIVENESS
 - 30-DAY CALLUP
 - 5-DAY PAYLOAD CHANGE-OUT



NASP DERIVED VEHICLE

- REVOLUTIONARY TECHNOLOGY
- CAPACITY COMPLEMENTS HEAVY LIFT
- EXTREMELY RESPONSIVE
 - AIRCRAFT-LIKE OPERATIONS
 - 24-HR TURNAROUND

These are three different approaches to future launch systems: the NASA approach, which is the Shuttle C, taking advantage of the existing infrastructure supporting the Shuttle and, instead of putting an Orbiter on, you put a cargo vehicle.

From the national perspective, this works a heavy lift problem fairly well and gets you a capability earlier. From our perspective in the Defense Department, we do not have a requirement for that heavy lift until the SDI era. But, because it is based upon Shuttle capacity and because it is a very complex vehicle, you probably are only going to get about three flights per year, and your call-up is about 180 days, not particularly useful for the Defense Department's needs.

We have talked about the ALS. In this case we are talking about a modular family that can go down to the low end of 1,000 pounds all the way up to 200,000 pounds, with a 30-day call-up as opposed to that 120 days that I mentioned with the Titan IV, and the ability to change out payloads—this is something we cannot do now—change out payloads within 5 days, written into the requirement.

Finally, in the further term, further out, is NASP, clearly a revolutionary approach, and I will touch briefly on that.



ADVANCED LAUNCH SYSTEM

**JOINT PROGRAM UNDER AIR FORCE MANAGER TO
PROVIDE SIGNIFICANTLY IMPROVED OPERATIONAL
SPACE LAUNCH**

- **DEVELOP TECHNOLOGIES AND OPERATIONS
CONCEPTS FOR NEXT GENERATION OF RESPONSIVE
LAUNCH VEHICLES**
- **IMPROVE EXISTING LAUNCH SYSTEMS**

ALS FAMILY OF VEHICLES ESSENTIAL TO MEET NEEDS INTO NEXT CENTURY
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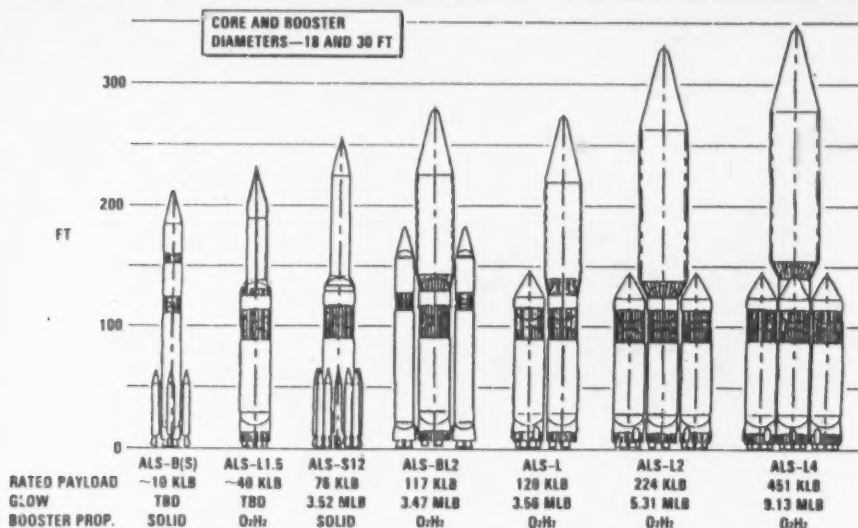
The Defense Department's approach to the future of the launch program is the Advanced Launch System, or ALS. I wanted to emphasize, it is a joint program. We have an Air Force program manager, but a NASA deputy. We have a lot of high-priced NASA talent on board with us out in Los Angeles, and NASA spends about half the budget.

Two purposes: to develop those technologies and operational concepts to support future war-fighting needs, as well as our peacetime needs; and then to improve the existing launch systems, those Titans and Atlases, to spin off that technology.



AN ALS FAMILY

BASELINE



I have been referring to the family, so I thought I would put a chart in here to give you an idea of what I am talking about when I say "family." And I mentioned to you that the family runs from a low earth orbit capability of 1,000 pounds up to 220,000 pounds.

This is just one of the launch vehicle houses', contractors', proposals. This is General Dynamics. The important thing I want to emphasize is the economies of scale and modularity. That is, you use the same core vehicle, the same engines, all through these classes.

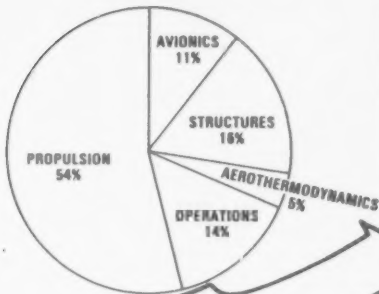
The pictures represent sameness. You have the same structures, the same tankage. You use the same strap-on boosters. And so that is literally a Tinker-Toy approach, so that you can maximize such that one engine development allows you to take care of the whole range of launch vehicle requirements.

The Soviets, you might recall, do a lot of the same business.



ALS TECHNOLOGY FUNDING

ALS TECHNOLOGY BUDGET
(FY 90-91)
\$304.5M



ALS TECHNOLOGY FUNDING
(\$ M)

FISCAL YR	90	91
PROPULSION	88.5	75.0
AVIONICS	13.4	20.4
STRUCTURES	21.8	27.0
AEROTHERMODYNAMICS	5.8	8.0
OPERATIONS	16.3	24.2
TOTAL	145.8	154.6

NASA-MANAGED
PROPULSION RELATED
EFFORTS
(\$M)

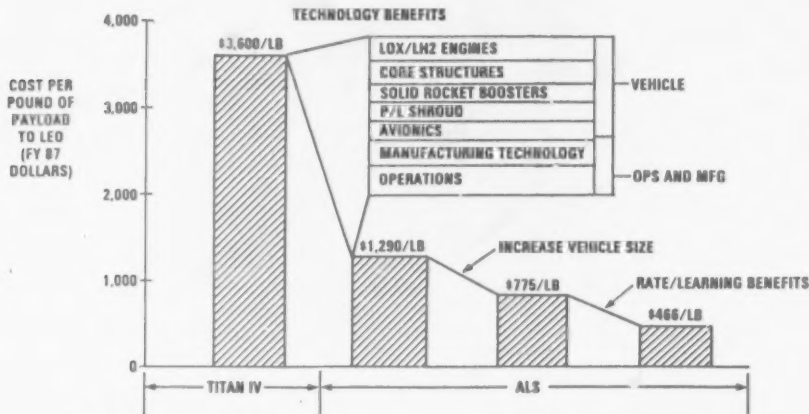
FISCAL YR	90	91
	97	83

I will not spend a lot of time on this, but of about \$450 million in the ALS budget for 1990 and 1991, about three-quarters of that is for technology, as you might guess. And the long pole in the technology tent is propulsion. That is the thing that takes you the longest and is the toughest problem.

NASA has the responsibility for the propulsion effort, but it is not all being done at NASA centers. The Air Force has a big piece of that pie. We are looking at the design of a new lightweight engine, high performance engine, probably a hydrogen-based, liquid-based engine. And here is how we are spending our money.



ADVANCED LAUNCH SYSTEM PATH TO REDUCED OPERATIONS COSTS



I mentioned to you that the cost to orbit for the Titan class of vehicles is about \$3,600 per pound. We did a study a few years ago and said that it might be realizable that we could get somewhere in around \$300 per pound to orbit.

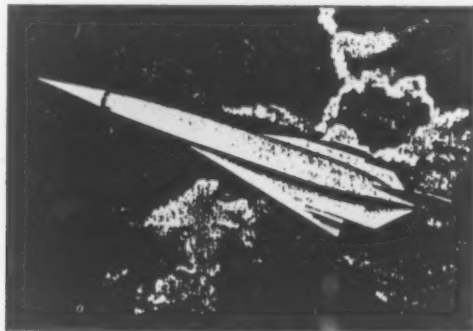
That has become the goal for the ALS program or any development effort in the launch business. And what this chart is trying to show is that this is current. By using technologies that now exist, not things we have to invent and things we have developed in other programs, we drive that down by a factor of three.

Then, if you want to increase vehicle size, wherein you can put multiple payloads on, you drive it down to about \$775 per pound. And then finally, you come close to the \$300 per pound by rate. That is, if you launch enough of them you can get in that area.

In the Air Force, we believe this is a noble first step, cutting by two-thirds the cost of transportation.



NATIONAL AEROSPACE PLANE (NASP)



- REVOLUTIONARY FLIGHT VEHICLE TECHNOLOGY PROGRAM
- JOINT DOD-NASA PROGRAM
- 3-PHASE APPROACH
- CAPABILITY POST 2000
- UNDER REVIEW BY NATIONAL SPACE COUNCIL

Let me conclude with a look out to the future, and the furthest out of the programs that we are looking at that have space launch applications, of course, is the NASP. The NASP, in contrast to ALS, which is an evolutionary system using technologies that are basically mature, is a revolutionary approach to the problem. A lot of things have to be invented to make a Mach 25 vehicle a reality.

This also, like ALS, is a joint DOD-NASA program. But in the Reagan budget the funding is 80 percent DOD and about 20 percent NASA.

The program office for this is out of Wright Patterson. It is a three-phased approach. We have passed the first phase, which was technologies in engine design as well as materials.

We are now in phase two, which is looking at focused technologies which will give us a decision base whereby we would make a decision whether to build the first experimental vehicle, the X-30, the first of two. In contrast to ALS, which is 1998, this is somewhere beyond the year 2000.

However—and General Piotrowski made a comment about rapid launch capabilities. Ideally, this would be single stage to orbit, launch within 24 hours, to get you around the 10,000 pound payload. So it now begins to deal with that responsive launch capability.

As you all are probably aware, the amended Presidential budget or President Bush's budget, the Defense Department recommended to the White House a reduction in funding for NASP of some \$200 million in a \$300 million DOD budget and the transfer of management of this program to NASA. That has been remanded by the

White House to the National Space Council and I understand they meet next week in their first meeting.



SUMMARY

- NATIONAL SPACE LAUNCH CAPABILITY RESTORED
—REBUILDING ON-ORBIT CONSTELLATIONS
- AIR FORCE FOCUSED ON COMPLETING INFRASTRUCTURE FOR ASSURED ACCESS TO SPACE TO MAINTAIN ON-ORBIT CAPABILITY
- ALS FAMILY OF VEHICLES ESSENTIAL TO MEET OPERATIONAL NEEDS INTO NEXT CENTURY

Mr. Chairman, in summary, we have restored the national launch capability. We are now setting about rebuilding our on-orbit constellations. The good news during this time was, because of the genius of our aerospace industry, our satellites lasted a lot longer than we thought and there were very few cases where we really lacked in capability as a result of the Challenger and Titan accidents.

However, a lot of time has gone by, and I have mentioned the backlog. We now have to go about rebuilding our on-orbit constellations. We are focused on making sure we build a strong infrastructure for that assured access, and that is infrastructure in terms of launch capacity, bases, as well as production capacity.

However, we still have a lot of shortcomings. The program that the Defense Department looks to to deal with those shortcomings is the Advanced Launch System.

That concludes my presentation.

[The prepared statement of General Moorman follows:]

PREPARED STATEMENT BY
MAJ. GEN. THOMAS S. MOORMAN, JR.
U.S. AIR FORCE, DIRECTOR OF SDI AND SPACE PROGRAMS
OFFICE OF THE ASSISTANT SECRETARY
OF THE AIR FORCE FOR ACQUISITION

I am pleased to be with you today to discuss the Department's space program, and to share this opportunity with Dr Schneider. We have made enormous progress in our national security space program over the past year, and I welcome the opportunity to share some of the results with you. This Committee has played a leading role in structuring and supporting the space launch recovery, and you can take great pride in the accomplishments.

Summary of Launch Recovery Activities

The Space Launch Recovery, consisting of major efforts by NASA to return the Space Transportation System to safe operations and by the DOD to reestablish a robust expendable launch vehicle capability, began immediately following the Challenger and Titan 34D accidents in early 1986. Both aspects of the Recovery have been successful, as evidenced by flights of the Shuttle and the Atlas E, Titan II, Titan 34D, Delta and Delta II. While the launch systems initiated under the recovery program will continue as long as we fly the current generation of launch vehicles, by 1990 we will have crossed the threshold from "recovery" to "sustained operations" of a national mixed fleet of space launch vehicles.

Within the DOD launch recovery program, several key milestones have passed, and others are scheduled over the next three years. The first launch of the Delta II, carrying the first production Global Positioning System satellite, occurred in February, less than 26 months after contract award for this new

class of medium launch vehicle. The second launch of the Delta II is scheduled for early June, and a third launch will occur in late July or early August. We are pleased with the performance of this new launch vehicle as well as with the new GPS satellites. We have taken the first operational steps toward the full constellation of 21 primary satellites, plus spares on orbit, that will ensure worldwide coverage for our forces. Of course, GPS will provide unprecedented navigation and position accuracy for civil users, as well.

Initial Launch Capability for the nation's largest unmanned vehicle, the Titan IV, was achieved in February 1989. However, we had to delay the first launch of this vehicle because of conflicts in the support infrastructure at Cape Canaveral. Specifically, we had to work the allocation of resources for processing the Inertial Upper Stage that was flown successfully on the recent Shuttle mission that launched the Magellan spacecraft to Venus. Now that the processing conflicts are clear, the preparations for Titan IV launch are again underway.

As you are aware, a Titan 34D was launched on May 10 from Cape Canaveral, with a classified payload. This successful mission was the next to last of this fleet of boosters. The final launch will occur this summer.

Following the FY 1989 launch activity from the Titan facilities at Cape Canaveral AFS, Space Launch Complex (SLC)-41 will undergo modifications to support the Titan IV with Centaur upper stage, and SLC-40 is scheduled to be modified from its present Titan 34D/III configuration to be able to support the Titan IV/Centaur and the commercial Titan 34K. The SLC-40 modifications and a new Solid Motor Assembly Building capable of handling the new Titan IV Solid Rocket Motor Upgrade (SRMU) and providing essential expansion of the launch capacity at CCAFS are

included in the FY 1990 budget. The availability of the first SRMU may be delayed by six months as a result of the recent fire at the propellant mixing facility at Magna, UT, but an option for six additional sets of the present Solid Rocket Motor was exercised last fall to ensure that our manifest can be flown.

The Atlas II launch vehicle and modifications to SLC-36 and the Defense Satellite Communications Systems III satellites for launch with the Centaur upper stage continue toward a mid-1991 initial launch capability. The Atlas II, a derivative of the proven Atlas Centaur, was selected following an intense competition for the DSCS missions and completes the family of medium launch vehicles required for east coast access to space through the mid-to-late 1990s.

On the west coast, modification of SLC-4 West was completed and the first launch of a Titan II took place in September 1988, providing the capability to launch payloads such as the Defense Meteorological Satellite or NOAA Polar Weather Satellite from Vandenberg. Modification of SLC-4 East to accommodate the Titan IV began immediately after the last Titan 34D mission from that complex in November 1988. Most of the structural modules have been shipped, and the site is expected to achieve initial launch capability (ILC) in mid-1990.

In accordance with Congressional direction, the Shuttle facilities at Vandenberg AFB are being converted to "Mothball" status and all assets that can be used in support of NASA or other DOD programs are being transferred. That process is nearly complete, and full Mothball status will be achieved by the end of FY 1989. A Report on the content, schedule and cost of the Mothball program was submitted to the Congress last July. The Air Force estimates that it would require approximately \$1 Billion and 4-6 years to restore SLC-6 to flight status for manned Shuttle operations. Although the 4-6 year lead time will

probably be valid indefinitely, the cost estimate will increase over time as the Shuttle launch facility configuration at Kennedy Space Center continues to diverge from the pre-Challenger baseline.

The requirement for additional Titan IV capacity for launches to polar orbit was identified early in the launch recovery program. The number of launches required in the late 1990s will exceed the capacity of 2-3 launches per year that can be supported from SLC-4 East. In addition, there is significant vulnerability of SLC-4E to damage from a launch accident involving SLC-4 East or SLC-4 West. The potential impacts to national security from an extended outage of SLC-4 East require a second launch facility to provide the necessary resiliency for an assured launch capability.

The Air Force began detailed requirements and concept definition for a second Titan facility in 1988. Although no FY 1989 funds can be expended on the new second west coast Titan IV complex, known as SLC-7, the Air Force has continued to assess the capacity limitations on Titan IV and the alternatives to meet the validated launch requirements. The amendments to the FY 1990 budget defer the initial MILCON request until FY 1992, delay the ILC for a second west coast pad by at least one year, and identify the modification of SLC-6, the Shuttle facility at Vandenberg AFB as the primary candidate.

It is the DOD's intent to thoroughly review the implications of modifying SLC-6 before doing any work that commits us to one path or the other. A Defense Science Board study of launch options will be a major factor in that review, along with other studies being conducted within the Air Force. The FY90 budget request is intended to provide the assets to perform the detailed technical, cost and policy analysis and design work that would be applicable to both approaches. Once a decision on the site is made, detailed development efforts leading to modification or

construction will begin.

DOD Plans for Assured Access To Space through 1995 and Beyond

The DOD recently delivered the National Space Launch Plan, approved by the President, to the Appropriations Committees of the Senate and House of Representatives as well as to the Committees on Armed Services of both Houses. The plan provides a detailed description of the DOD plans for assured access, and the limitations which could impact that goal. Specific program plans for each DOD launch vehicle and DOD payload, as well as an extensive review of the launch policy and strategy, are included. This plan took longer to complete than we had anticipated, in part because of the extensive review it received across the Executive Branch. We hope that the result, which reflects a fully coordinated approach from NASA and the DOD, will be helpful in your deliberations.

Unfortunately, assured access remains an elusive goal. We have set as our objective to identify at least two paths to space for each of our payloads, and I will discuss our progress in that regard in a moment. However there are some basic constraints that limit our ability to provide assured access.

First, for our heaviest payloads, and for those satellites that must be placed in synchronous orbit and weigh more than 5,000 lbs., our only launch capability will be the Titan IV with a Centaur upper stage. The Shuttle cannot carry the Centaur for safety reasons; thus we have no backup capability for this critical "heavy" end of the payload spectrum. Since we do not have the resources to develop an independent upper stage, we will remain dependent on the Titan IV/Centaur launch vehicle for the foreseeable future.

Second, as a result of the loss in Shuttle capability following the Challenger accident, we have reconfigured our heavy

payloads that must fly in polar orbit to use the Titan IV. We do not believe it is realistic to try to maintain these payloads in a configuration that would allow both Shuttle and Titan IV launch, even if the Shuttle regains its lost performance and SLC-6 is returned to operational status. Reactivating SLC-6 would take at least four years, and probably longer, forcing us to remain dependent on the Titan IV for these payloads as well. One of the major vulnerabilities to this approach is the availability of only one launch facility for the Titan IV on the west coast. As I mentioned, it is critical that we begin the detailed work in FY 1990 to provide a second launch facility to provide capacity, resilience and operational flexibility.

For other payloads, we are much closer to assured access. While we plan to fly each payload on one specific launch vehicle, and optimize the design for that approach, we have protected the option for alternatives. For example, the Defense Support Program satellites are configured to fly on either the Titan IV or the Shuttle, and are scheduled to fly on both. We will maintain this option at least through 1991, when it will no longer be cost-effective for us to maintain the capability to fly classified payloads on the Shuttle. The Defense Satellite Communications System (DSCS) spacecraft can fly on the Titan and Shuttle today, and are being modified to fly on the Atlas II. We will decide later this year how long to maintain DSCS dual compatibility once the Atlas II comes on line. The Global Positioning System flies on the Delta II today, and can fly on the Shuttle. We are working the integration of GPS on a second ELV, possibly the Atlas II, to provide an assured backup for this payload. So, in general, where we can do so without extraordinary expense or technical risk, we are maintaining launch options for DOD satellites. Unfortunately, and I emphasize this point, this does not apply across the board, and

it will certainly become more expensive as time goes on. In an environment of constrained or decreasing budgets, our flexibility in this area will be reduced.

While our launch capability is not as robust as we would like, once we get past the backlog of satellites waiting to fly as a result of the 1986 accidents, we expect to meet all the replenishment needs identified by USCINCSpace and our other users. Of course, this presumes that the programs we have included in the FY 1990-1991 budget are fully funded.

Senator EXON. Gentlemen, thank you very much.

We will begin the questioning, and I will ask that we limit our questions to 6 minutes per round.

MODERNIZATION OF COMMAND AND CONTROL

Let me start by asking a question of you, Admiral. I believe that the necessary upgrading and modernizing of our command and control capability can be confusing to the lay person.

But we have changed our basic strategic thinking from a focus primarily upon a bolt out of the blue attack. Today, we are moving away from that, although we still have to guard against such a possibility, regardless of how remote it is. We are also concerned with maintaining command and control of our forces throughout a crisis and not just the first few minutes or hours.

I assume all of this makes our concern about the survivability and detection of our missile submarines greater. Are you convinced that we are up to speed on command and control of our missile submarines and that we can communicate with them in ways in which they could not be detected?

Admiral CARGILL. Yes, Mr. Chairman, I would like to attempt to respond to that. I feel that we describe sometimes our communications systems to our submarines as peacetime communications, where in actuality in phases where there is no particular tension there is a large amount of communications that do go to the submarines on a daily basis that provide for water management and positioning and daily routine type operations; that as tensions increase and as hostilities may appear to be more imminent, the information that is passed then can become intelligence and [deleted]. We do at this moment or any other moment have those TACAMO aircraft 365 days a year and 24 hours a day on station both in the Pacific and the Atlantic to respond with the most urgent emergency action message at any time.

The ELF system which I described as being now in operation, is undergoing testing and will be, very shortly, in full operation with synchronized messages from both the Wisconsin and Michigan sites.

ELF SYSTEM

Senator EXON. Let me interrupt you there. We have been talking about ELF ever since I came here 10 years ago. How is it shaping up?

What do your early tests indicate? Is it as successful as we had hoped it would be?

Admiral CARGILL. Yes, sir. The first site was turned on in 1986 and tests have been run. The second site, Michigan, has now reached full power, just in May of this year, the 16th, and results are coming in.

We have conducted considerable communications tests with submarines and the results are very favorable. We have tested the ranges, we have tested the power levels, and so far we have not found any difficulties.

Senator EXON. So is it safe to say that with the new Michigan facility, ELF has met its goals?

Admiral CARGILL. Yes, sir, I would definitely say it has. We have had to deal with environmental concerns and we have installed propagation mitigation sensors and testers to ensure that there was no environmental problem, and that has taken some time.

But operationally, the test work that we have conducted to date has been very, very favorable.

Senator EXON. Thank you.

Let me ask each of you a general question.

When General Piotrowski was here, this Senator got the impression that he felt that we had to have a wholesale change in our approach to all of this. It seems to me that, from what you have told us, you are making some improvements, but I do not see any wholesale change.

Do you believe that General Piotrowski is overstating his concerns? And are his concerns as serious as each of you feel they are, given your knowledge and experience?

SPACE LAUNCH SYSTEM

Dr. SCHNEITER. Let me comment if I may on the space launch aspects. I think the concerns that he stated were concerns that we all share, and I think in a sense the only way some of that will be cured will be something akin to a wholesale change.

The philosophy behind the Advanced Launch System makes such a change. As General Moorman indicated, we can make advances at the margin on our current fifties and sixties technology systems, but we really need a clean sheet of paper if we are going to realize the kinds of changes that were talked about, particularly in terms of responsiveness, so we can decrease the time that it takes to get payloads ready, to be able to launch, and to turn around the pad.

We have to change the way we do business on the payloads, as well as on the launch systems, in order for those two together to allow us to do things as quickly as we would like to.

Senator EXON. Do you think then, Dr. Schneiter, that a revolution or a complete change in our posture is not feasible under present circumstances and budgeting?

Dr. SCHNEITER. We have budgeted money for the technology aspects of the Advanced Launch System program. We are not pursu-

ing that, as well as other things, as fast as we would like to, given the budget constraints. But we do have that program underway.

Senator EXON. Before I recognize Senator Thurmond, because my time is up on the first round, do any others among you have any comment in response to General Piotrowski's concerns?

General MOORMAN. Sir, in regards to space launch, when you say revolutionary, people tend to also equate that with a compressed time line. The message I would have for the committee is that, yes, I believe that you need a revolutionary change, that is a clean sheet of paper. But while you are doing that, you also have to maintain what you are doing, and that is going to have to be until probably the end of the century; but that we do need to change the way we think about the space launch business.

We are manacled to the way we did business in the sixties, and General Piotrowski's observations I think are correct.

Senator EXON. So we do need some breakthroughs?

General MOORMAN. Yes, sir.

Senator EXON. And we have to keep pursuing them actively, right?

General MOORMAN. Yes, sir.

Senator EXON. Thank you, gentlemen.

My time is up. Senator Thurmond.

Senator THURMOND. Thank you, Mr. Chairman.

MILSTAR PROGRAM

General Moorman, the MILSTAR program is one of the highest, if not the highest, priority C³ satellite program. I believe the program has encountered a number of delays, due in large part to the complexities and challenges of the program.

Can you provide the subcommittee with a status report on the program, its expected full operational capability, and any funding problems that may exist with the program?

General MOORMAN. Yes, sir, I would be glad to do that. The observations in your question are right. MILSTAR has had its share of difficulties, technological difficulties, programmatic difficulties, and schedule difficulties. My sense is at the outset we greatly underestimated the complexity of the task.

We attempted to put a great many tasks onto a single satellite, and we did it with what turns out to have been an unrealistic hope for an early IOC, initial operational capability. We have put an awful lot of effort in terms of dollars, in terms of resources, in terms of management attention, such that I can report to this committee that my sense in MILSTAR is that we have turned the corner technologically.

And what I mean by that is there were a great many things in the early eighties we set out to do in MILSTAR that were things that had never been done before. We have licked those problems.

That is not to say that I also can stand here, sit here, and look at you and say that we are totally out of the woods, in that MILSTAR has a lot of different components and we will be delivering components to the integrating contractor, Lockheed, this summer and into the fall.

Making all those components work together and testing all the software and all those antennas that you have on MILSTAR is going to be a significant task. However, I think we are going to make the schedule, which is [deleted]. And I think once we get into the test and evaluation we will stabilize our cost problems.

So by and large, the news from MILSTAR is very positive, sir. But we are not totally out of the woods.

SPACE CONTROL REPORT

Senator THURMOND. General Moorman, in the fiscal year 1989 DOD Authorization bill the Congress requested a report on space control. This report, which was due in February of this year, has not been delivered to the committee.

Can you tell the committee why it is late and can you provide the committee with a summary of the report, so that we might understand the requirements for an ASAT system, for which the administration has requested new funding for a number of ASAT research programs?

General MOORMAN. If I could, I would talk a little bit about that and then perhaps—

Senator THURMOND. Would you rather answer for the record?

General MOORMAN. Well, it is an OSD-sponsored report, sir. And as to the reasons in the delay, my perception as a contributor to that report—and I chaired the OSD-level committee that looked at ASAT options for the future, so I have some insights. But I do not believe I have a total insight.

One of the reasons for delay, I think, sir, is that the space control report was being prepared at approximately the same time that the new administration was coming in and a new Defense team, as you are certainly familiar. One of the things that this new administration has been doing is developing a new strategy—National Strategic Review 12, NSR-12.

Part and parcel of that is our ASAT posture. The dovetailing of the ASAT report and that NSR has increased the administration and coordination process of that. The report underscores or supports the ASAT program, Senator Thurmond, that was proposed in the Reagan budget, and that is the pursuit of a kinetic energy, ground-based or sea-based kinetic energy system, as our first priority using technologies developed by the SDI program, wherein you would [deleted].

It also provides money to the Army for the development of ASAT applications for the free electron laser program that the Army is developing as part of the SDI program, so that we could down-select the ground-based laser approach for the ASAT task in the 1991 time frame.

It also provides money to the Air Force to upgrade the space surveillance network. It is clear that our current ground-based space surveillance network is not sufficient to support the ASAT task and we have to upgrade it to be able to work the data processing and all the targets, as well as the time line.

Finally, the report alludes to the establishment of a joint program office for the kinetic energy ASAT system at Huntsville

MINIATURIZATION

One is miniaturization. All of us are familiar with going into an electronics store and seeing a powerful hi-fi set which is now very small; Walkman's are getting smaller and people are running with full electronic gear, and so on. The question that comes out of that is, what are the implications and plans in the Air Force, within the Department of Defense, for taking advantage of miniaturization?

It would appear to me that as you go to smaller and smaller technologies elsewhere, the ramifications of that for our space vehicles, the ramifications of that for the cost of launch, are very significant.

Is that correct?

General MOORMAN. Absolutely, and I think Dr. Quinn also, because we can offer a lot in this area, because where we see the advantages of miniaturization, one of the areas we see that is in the C³ world.

And if you would look at the various generations of satellites, be they reconnaissance satellites, communications satellites, you see the miniaturization at work. We packed a heck of a lot more capability in the same size of satellite than we ever did before.

The most dramatic example of that is MILSTAR. We are using custom large-scale integrated circuits, some 700 of them, on a satellite. And they provide an unprecedented capability. It is the state of the art in electronics. What that allows you to do is get a lot more capability in a smaller area.

Now, traditionally what we have done, however, and one of the things that General Piotrowski has as a concern, is that—I mentioned to Senator Thurmond that our upper limit is 10,500. We invariably design the satellite—if we can boost 10,500, we design it to 10,500.

And you may ask, well what about the advantages of micro-miniaturization? What happens is, the 10,500 you get in 1989 buys you a lot more in capacity, reliability, and throughout, et cetera, than the 10,500 would buy you 3 years ago.

Senator WIRTH. I see.

General MOORMAN. But the space programs probably are the leader, if not the leader certainly one of the leaders, in the micro-miniaturization business.

Senator WIRTH. Have you all done or are you continuing to do an analysis that suggests that maybe we do not want to go to 10,500, but you may want to go to 2, and 2 is the—pick a number—a fifth of the size is the optimal size, because that also makes, I would think, the cost of launch significantly less expensive and gives you a lot more flexibility.

Some may see ASAT as an issue, as a concern for the Air Force, that it makes that more complicated for the opposition to the ASAT program.

General MOORMAN. Sir, I have focused on the 10,500, and perhaps in a way to mislead you a bit. That is our upper limit.

Senator WIRTH. I understand.

General MOORMAN. And the reason I focus on it is because it is the real expensive, Spanish Armada, grandiose satellite. If you step down to that, you step down to the Delta II, for example, which is

launching a GPS, which is about 2,500. So you are launching smaller satellites that we buy in larger numbers, and GPS is the classic example.

Now, when you go below that—and there is a program DARPA is looking at, how can you design smaller satellites to do less robust missions, but nevertheless critical missions for war-fighting.

Senator WIRTH. Do you have money? Is there a place in the budget where the research in this shows up? If 10,500 is what you can boost up there and everybody goes to 10,500, contractors go to 10,500 and try to pack more into 10,500. And you know, you get a bigger car, it goes down the road and it is more comfortable, or whatever it may be, but you use up a lot more fuel.

It would seem to me you want to try, as with all of these things, you want to figure out how to drive maybe smaller, less expensive, and presumably less vulnerable satellites.

General MOORMAN. The formal answer to your question is, yes, in the LIGHTSAT program under DARPA, the advanced space technology program specifically addressed that.

Senator WIRTH. How much is in there?

General MOORMAN. I think in 1989 there is some \$35 million.

Senator WIRTH. Now, is that enough to do the job the way it ought to be done?

General MOORMAN. Well, what has to be done is that DARPA operates best as a provocateur, that is demonstrating a capability and then passing it to a service to actually build, okay. That is enough to provide some basic experiments.

DARPA would like more money. It is going to compete hard to try to get more money, but that is the formal answer. And in every SPO program, at least in the Air Force, and I am sure in the case of the UHF Follow-On in the Navy, there are lightweight efforts, efforts to reduce the size and weight of satellites. So there is an awful lot of effort going on.

Senator WIRTH. It seems to me that you described DARPA as the leading edge of that. That is one of the things that is our responsibility to do, is push and say, are you really looking at this? This is something where institutional momentum, I would think, tends to go in the other direction.

And my concern would be, has that been given adequate attention? Is that something we ought to be pursuing, we ought to be pushing you on?

Would you like to get back to us on that? Is this something that has received the kind of attention which you think it deserves?

General MOORMAN. Sir, the whole LIGHTSAT issue has gotten an awful lot of attention, primarily because of the needs of the CINCs.

Senator WIRTH. Is there an analysis that has been done as to what that would do to the commitment of the Air Force to pursue an ASAT program?

General MOORMAN. I guess I am not following you, sir. I am sorry.

Senator WIRTH. Well, it seems to me that if you went to a lot of smaller satellites and you spread your capability, instead of 10,500, one that was 10,500, you had five at 2, and you are multiplying that, that makes the ASAT mission of the other side a lot more

complicated. And if we put up an ASAT, their response could perfectly well be: Well, what we are going to do is we are going to miniaturize in a lot of different ways.

Why is that not a perfectly logical response?

General MOORMAN. It is a logical response, but let me tell you the difficulty. There is a logic to what you say. First of all, I am an acquirer and not a requirer. We build satellites to what the users ask for. Now, when you look at peacetime capability and the satellites that we build that are very heavy are extraordinarily capable, because the users, to include the CINCs, in the peacetime have asked them to be such, and the national intelligence community has asked to be such, and the SIOP forces have asked it to be such.

Senator WIRTH. But those requests were made more than 3 years ago, at a time when things were a lot bigger than they are today, is that not right?

General MOORMAN. They continue to be today.

The demands for the requirements, demands on us satellite builders, are immense. The only voice for the smaller satellite is the immediate responsive, not particularly capable, but meeting a single need, satellites on the part of CINCSpace and the users.

Your premise says the way to lick the ASAT threat is proliferation. Yes, sir, that is an approach. But each one of your proliferated satellites is significantly less capable than your single one.

Now, what the Air Force is doing is trying to make that single one more survivable and keep the capability that you have, and that is because that's what our users have asked us to do. There is no such thing, sir, as a satellite that weights 300 or 400—well, let us say 600 to 1,000 pounds, that is anywhere near as capable as one that weights 7,000 or 8,000, because the same micro-miniaturization capability is going into the heavy one as is going into the light one. It is a game.

If you are satisfied with less capability, which so far the requirements community has not been, then yes, of course you can proliferate and build smaller.

Senator WIRTH. My time has expired, Mr. Chairman.

If you could have one of your people give me a page or two on what your plans are for the acquisition of Titan IVs?

General MOORMAN. Sure can.

Senator WIRTH. And the Delta. That would be great.

Thank you.

[The information follows:]

TITAN IV ACQUISITION

CURRENT ACQUISITION PROGRAM

The Titan IV program is a fixed price incentive fee contract for 23 vehicles. The initial contract for 10 vehicles was definitized in February 1985 as a complementary launch vehicle to the Space Shuttle. Twenty-three vehicles are now on contract of which thirteen are under a multi-year buy for the Air Force. The additional 10 vehicles are for and funded by a classified user.

A follow-on contract for 18 more vehicles is currently in negotiation and will include an option for eight additional vehicles. All 18 vehicles are for and are funded by a classified user.

The 23-vehicle contract is 42 percent complete.

The Titan IV is DOD's largest expendable launch vehicle capable of placing 39,000 lb. to low Earth orbit; 10,000 lb. to geosynchronous orbit (5,000 lb. greater than Shuttle capability).

Launch facilities will consist of two launch sites at Cape Canaveral, FL, and two launch sites at Vandenberg AFB, CA.

The first Titan IV was successfully launched on June 14, 1989.

Procurement Schedule:

TITAN IV—TOTAL VEHICLE BUY (THROUGH FISCAL YEAR 1995)

	1987	1988	1989	1990	1991	1992	1993	1994	1995	Total
23 vehicle buy:										
Air Force.....	1	4	3	3	2					13
User	1	2	2	2	3					10
Subtotal	2	6	5	5	5					23
Follow-on buy:										
User					4	2	6	6		18
Post follow-on buy:										
Air Force.....								4	4	8
User									6	6

Beginning in fiscal year 1994 a procurement rate of 10 a year is planned.

Colorado Facilities: Martin Marietta Astronautics Group (MMAG), Denver, CO.

MMAG facility was built in 1958 to support ICBM development and deployment for the United States Air Force.

Today, MMAG employs approximately 13,000 technical people, engaged in a wide range of design, development, analysis, fabrication, assembly and test activities. The primary product is the Titan launch vehicle family and one-of-a-kind satellites.

MMAG is actively involved with industry education groups at all Colorado front range universities.

The Denver facility is the Astronautics Group extension of the Martin Marietta Corporation located at Bethesda, MD.

Titan launch vehicle assembly is accomplished at Denver.

The Denver facility has engineering, manufacturing assembly and test capability.

Engineering related to requirements, design and analysis is performed.

Manufacturing includes detail piece part machining, electronics and welding.

Perform assembly of Titan launch vehicle, first and second stage and black box electronics.

Perform factory checkout and test of structural, electronic and hydraulic systems.

SIZE

The Denver facility consists of the following primary areas:

Factory—200,000 square feet.

Electronic Manufacturing Facility, 150,000 square feet.

Inventory/Storage facility, 300,000 square feet.

The facility sits on 780 acres of contractor and Air Force property.

Denver facility working toward a production rate capacity of 16 launch vehicles per year with a long range manufacturing capability of 20 launch vehicles per year.

Additional capabilities:

Space Simulation Lab;

Acoustic Vibration Lab;

High Bay Spacecraft Clean Room; and

Space Antenna Test Facility.

DELTA II ACQUISITION

CURRENT ACQUISITION PROGRAM

The Delta II program is a fixed price incentive fee contract for twenty vehicles that was definitized in January 1987. A firm fixed price follow-on contract for an additional 15 vehicles is scheduled for fiscal year 1990.

Twenty vehicle contract is 50 percent complete.

The Delta II is a medium class launch vehicle developed to launch Global Positioning Satellites following the loss of Shuttle launch availability after the Shuttle Challenger accident. The current Delta II launch vehicle can lift the 1850lb GPS II satellite to an 11,000 nautical mile semisynchronous orbit. The future Delta II (October 1990) which will have improved strap on Motors and will be able to lift the 2500lb GPS IIA satellite to orbit.

Launch facilities consist of two launch pads at Cape Canaveral, Fla.

The first two of 20 vehicles on contract were successfully launched on February 14, 1989 and June 10, 1989 respectively.

Launch and procurement Schedule:

	Fiscal year—							
	1987	1988	1989	1990	1991	1992	1993	1994
Launch			4	5	5	5	5	3
Procurement	7	7	6	1	3	3	2	4

Beginning in FY 95 a GPS replenishment of four launches per year is planned.

Colorado Facilities: McDonnell Douglas Space Systems Company (MDSSC), Pueblo, Colorado.

The MDSSC facility in Pueblo, Colorado was designed and built to support the United States Air Force Delta II launch vehicle program. MDSSC chose Pueblo to build their facility because of the ample labor supply. They also liked the positive environment created by the local college and university, the high-tech nature of the area, the available airline flights to Orange County, and the pro-business local community.

The Pueblo facility is an extension of the MDSSC manufacturing facility in Huntington Beach, California.

Hardware shipped from MDSSC, Huntington Beach and other subcontractors to Pueblo.

Final assembly accomplished at Pueblo.

Major sub-assemblies shipped from Pueblo to Cape Canaveral Air Force Station for launch site integration.

The Pueblo facility is primarily an assembly plant.

Assembly of some major sub-assemblies such as the engine section and guidance section.

Performance of final assembly of booster, second stage, and payload fairing.

Performance of factory checkout of propulsion, electrical, and hydraulic systems.

SIZE

The Pueblo facility consists of three interconnected buildings with a total of 190,000 square feet of work space.

The facility sits on 11 acres of property.

Approximately 300 people are currently employed.

Pueblo working toward a capacity of assembling 12 vehicles per year.

Senator EXON. Thank you very much, Senator Wirth. We are going to have another short round of questioning.

NEED OF MORE SATELLITES

Let me start my second round, if I might, Dr. Quinn, with you. General Piotrowski argues that the military needs in some cases

less capable, but more survivable, satellites, and broader coverages are needed than those that we have in the national space program.

My question is, is it realistic to expect the national space program to compromise on technical performance? Ultimately, is it realistic to think we can afford two sets of such systems?

Finally, would you agree that fundamentally we will have to be content with modifying national assets over time to make them more survivable and more responsive to military needs?

Dr. QUINN. Well, if you are addressing the same area that was just discussed here today by General Moorman of trying to get more satellites instead of fewer, more capable satellites, one of the difficulties you have is that the ground segment has to be taken into account. And so we need to make sure we have looked at the entire system and tried to provide survivability. And there are two facets of that that I tried to address a little earlier.

One is that there is more to it than just the space system. There are other kinds of systems. There are aircraft systems, there are ground-based systems, and so on. And the idea is to provide as much survivability and proliferation across a whole base of systems, to give a total survivability and endurance to the C³ system.

Now, we would all like to see the satellite systems become cheaper and smaller. Lightness, almost everyone is in favor of that. The difficulty is, when you start out with a satellite, you start out first with what we call a bent pipe, a simple transponder. The Oscar is often used as an example, and if we can build those so cheap for the hams then why can the military not do likewise?

Well, the difficulty is, if you try to put a military capability into a satellite then you have to add some features to it, and you add more capacity. You add anti-jam capability, you add a control system for the satellite. Each of these things that you add to give it a military capability adds to both weight and the cost.

So there needs to be a compromise in requirements and capabilities in the satellite if we are going to bring the costs down. So far, as we have said, it has turned out to be more cost effective to put many features into one satellite and then attempt to make that satellite survive by giving it radiation hardness, by giving it anti-jam capabilities, electronic capabilities such as spread spectrum, null steering antennas, maneuverability, all of these kinds of features to make it survivable.

And then there is much less burden on the ground terminals. The ground terminals, it turns out, in most of our satellite systems are the most expensive component, because there are many, many, many more terminals than there are satellites. So we have much more invested in the ground environment.

And you cannot take a simple ground terminal that operates, for example, with a UHF FLTSATCOM satellite and have it also operate with a simple transponder, Oscar type of satellite.

So you have to take into account the entire system, the ground segment as well as the space segment, in trying to optimize. And as I said, we would like to see the systems become smaller, lighter, cheaper, and do that, and we support the kind of research that DARPA is doing.

But there does not seem to be any real simplistic approach that we can just grasp and all of a sudden make the satellites lighter, for all those reasons.

Senator EXON. Thank you.

My last question today, although I will have some additional questions for the record, is to you, Admiral Cargill.

[Deleted.]

In your view, are the Navy's strategic communications sufficiently reliable and timely and is the data rate high enough to replicate all the desirable characteristics of the ICBMs?

Admiral CARGILL. I believe we have looked at that, Mr. Chairman, and, with qualifications, we feel that the connectivity is timely and reliable enough to support that precept. [Deleted.]

Senator EXON. I have always felt that our boomers at sea must be the greatest deterrent to the Soviet planners. I have high regard for the threat that the new Tridents with the D-5, when we get it working, will pose. The only concern I have is that, while we should not close off any planning or programming in trying to find out better ways to do things than we have done in the past, I still feel that the relative balance among the legs of our triad has been a very good thing.

D-5 MISSILE

By the way, since I mentioned the D-5 missile, we had a most unfortunate early test. Can you tell us anything today about what we have learned about that and when the next test is scheduled?

Admiral CARGILL. Mr. Chairman, I am prepared more along the lines of strategic communications. I respectfully request to take that for the record if I may.

Senator EXON. I would appreciate that very much.

[The information follows:]

I am not an expert on the D-5 missile, but I have obtained information on the failure of the first underwater launch from the submarine warfare community. Analysis of telemetry data and recovered missile hardware confirmed a failure of the mechanical linkage transmitting the nozzle commands to the nozzle exit cone. The next launch is scheduled for July 28, 1989.

Senator EXON. Senator Thurmond.

Senator THURMOND. Thank you, Mr. Chairman.

TRANSITION PLAN FOR DSP TO BSTS

General Moorman and Dr. Quinn, you can both answer this. Can you provide the subcommittee with the transition plan for DSP to BSTS? At what number of DSP satellites do you plan to end the program and begin the transition to BSTS for our tactical warning and attack assessment capability?

Dr. QUINN. At the moment, we are planning on acquiring DSPs up through satellite 25. The current planning on the BSTS, which as you know is to satisfy both the tactical warning and attack assessment role and the SDI mission, the planning for that system is such that its current first launch as now scheduled would require us to buy DSPs at least through 25 and potentially 26. The program is funded through 25, and I believe 26 will have to be funded in the 1992 budget.

And General Moorman can correct me if I am wrong on that. So the simple answer is, up through 26 at the moment.

General MOORMAN. May I add to that, Senator Thurmond, just a bit on the transition. To my understanding, Dr. Quinn's comments are right on, funded through 25. We will await several things, the successful launch of the next DSPs, as to whether or not we need to buy 26 and 27, which are not funded.

But as Dr. Quinn points out, that is probably a 1992 budget issue.

Now, in regards to transition, I would like to spend just a second on that, and a formal report to you will have to await another date because it has not formally come through the building. But I do have some insight. It is being developed by General Piotrowski and his CINCSpace staff.

And when we speak of the transition between the country's primary warning system, DSP, to this SDI system, which will be a significantly greater capability, the planning for transition has to be done very conservatively and very carefully.

If General Piotrowski had his way and funds were not a consideration, he would like to have a total turnkey approach. That is, he would like to have a full BSTS constellation all operating and then transition. Well, clearly the country cannot afford—these are extremely expensive satellites.

So the approach that I think is being taken is a variation on that theme, and it is called regional replacement. And what that means is you get [deleted] such that you then can start drawing down the DSP capability.

When we are talking in terms of timing, [deleted].

Senator THURMOND. I have just two more questions and I have got to go to the floor.

BOOST SURVEILLANCE AND TRACKING SATELLITE

Dr. Quinn, I understand that General Herres is reviewing the requirements for the proposed Boost Surveillance and Tracking Satellite, which is intended to replace the current system for tactical warning and attack assessment, as well as to satisfy SDI requirements.

When will that review be completed and when can you provide the results to the committee?

Dr. QUINN. I am not familiar with the date when it will be. Are you?

General MOORMAN. I am not.

Dr. QUINN. I will take that for the record, Senator.

General MOORMAN. I do not know the date.

Senator THURMOND. Answer for the record.

Dr. QUINN. Yes.

[The information follows:]

General Herres, through the Joint Requirements Oversight Council (JROC), is reviewing the Tactical Warning/Attack Assessment requirements that are currently satisfied by the space-based Defense Support Program (DSP). These requirements have been approved by the JROC and incorporated into a Mission Need Statement (MNS). This MNS describes the mission to be performed, the threat and environment that the system must operate in, and the vulnerabilities of the current system to satisfy this mission. The MNS has been approved by the JROC and forwarded to the Defense Acquisition Board (DAB) for funding approval. This MNS does not contain detailed specifications from which to develop system designs, therefore, U.S.

Space Command is in the process of developing more detailed specifications for Air Force system engineers. These detailed requirements are expected to be validated in July 1989.

The Strategic Defense System (SDS) requirements are also being developed by U.S. Space Command. These requirements, however, are expressed in terms of mission effectiveness (number of booster and re-entry vehicle kills), and are not broken down into component requirements, such as early warning requirements. The Strategic Defense Initiative Organization (SDIO) is working with Space Command to develop an entire Strategic Defense System Architecture that satisfies the Space Command requirements. Milestones for the overall SDS design effort, which include early warning requirements as a subset, are: the Interim Requirements Review (March 1989), the System Requirements Review (March 1990), and the System Design Review (March 1991).

The DOD plans to satisfy the TW/AA and the SDS early warning requirements on the same platform (the Boost Surveillance and Tracking System (BSTS)). As described above, the TW/AA requirements will be approved relatively soon, but BSTS final system design will depend upon on the progress of the overall SDS architecture.

SURVEILLANCE OF AIRCRAFT AND SHIPS FROM SPACE

Senator THURMOND. Dr. Quinn, General Piotrowski advocates starting a new program for wide-area surveillance of aircraft and ships from space. The primary requirement of this system is tactical warning and attack assessment of air-breathing attacks on the continental United States. Yet, General Piotrowski and program officials acknowledge that the system is unlikely to be able to detect and track advanced threats, such as a stealth system.

Brent Scowcroft and others have argued that the Soviets will present the United States with advanced threats in the relatively near future.

Should this committee authorize a program that is not likely to meet requirements?

Dr. QUINN. Well, that is a rather deep question to take on. I think I would like to take that for the record as well.

Senator THURMOND. All right.

[The information follows:]

The Space-Based Wide Area Surveillance (SBWAS) mission includes detecting and tracking threats to the Continental U.S. as well as threats in the tactical battlefield. [Deleted.] The program is in the developmental stage and attempting to satisfy all of the requirements. It is recognized that most of the requirements can be satisfied with today's technology, and the issue is to determine which one of these technologies or combination of technologies will be most cost effective.

The advanced threats, which incorporate stealth techniques, are very difficult for radar systems to detect. Since the program is developing, there has been no commitment to a space-based radar program except for technology development. [Deleted] and need to be addressed before a commitment is made to that technology as well. The DOD is in the process of developing a program that can detect and track the current threat and evolve and perform this mission against future threats. IR systems or a combination of radar and IR systems may be able to satisfy these requirements.

General MOORMAN. Can I mention something on that?

Senator THURMOND. Yes.

General MOORMAN. The premise of your question, sir, that, if this wide-area surveillance system cannot see cruise missiles or stealthy cruise missiles, there is very little utility. Right now we are in a milestone competition, if you will, between a space-based radar approach proposed by the Air Force and an [deleted].

But I would submit to you that that really is not the purpose of that system. Frankly, if you wait until a large-scale attack

against—the cruise missiles have been launched—we do not possess the wherewithal to engage cruise missiles one on one with fighters. The beauty of either wide-area surveillance system is the ability to track from origin the carrier.

An analogy I might give to you, sir, is that what you want to do in the case of a bow and arrow or the archer is you want to get the archer and not the arrow. Wide-area surveillance systems which can surveil billions of square miles simultaneously can watch veritably all the staging bases, such that you can establish tracks for the carrier and, with reconnaissance programs, with other surveillance devices, use that system as a cueing device to work the carrier problem.

The country cannot afford the assets to work each individual cruise missile, sir. We have to work the carrier problem.

Senator THURMOND. I want to thank you, gentlemen.

Senator EXON. Thank you, Senator Thurmond.

Senator Levin.

ELF

Senator LEVIN. Thank you, Mr. Chairman. I have a couple of questions for Admiral Cargill about an old friend of mine, ELF and blue-green laser.

First on the ELF program, some of my folks back home are concerned that the electromagnetic output of the ELF system could adversely affect the biology or the ecology of the areas in which it is located and possibly interfere with telephone lines, TV, and radio reception, and electrical supply.

Can you tell us what the Navy has done to, first of all, measure the effects of the ELF transmitter in Michigan on the—well, first of all, measure the effects; and second, to mitigate those effects?

Admiral CARGILL. Yes, sir. The program was a phased approach, and it was recognized that there could be interference mitigation required. First of all, electronically, the systems were analyzed and then they were brought on line at very low powers, and the power was increased gradually as measurements throughout the lengths of the antennas were made.

Installations of permanent sensors were made. And we, as I mentioned before you arrived, sir, on the 16th of May we went to full power on the Michigan site. And measurements will continue to be made throughout the life of the system. The installations are permanent.

There has been a great number, several thousands of devices installed along the route of telephone, cable TV, and electrical lines and long fences to detect this interference. So interference mitigation programs are rather sizable.

Senator LEVIN. Is there any interference at all with people's TV reception, radio reception, electrical?

Admiral CARGILL. We have not been able to identify any. We have had claims which we have investigated, which turned out to be not factual, that we could prove.

Senator LEVIN. So you are satisfied that there is no interference, not just that it is ambiguous or unprovable, but you are satisfied there is no interference?

Admiral CARGILL. I believe that is the case, sir.

Senator LEVIN. Can you report that to people?

Admiral CARGILL. Yes, sir, that can be.

Senator LEVIN. Okay. Is that transmitter operational?

Admiral CARGILL. It is operational at 100 percent power. It is going through its testing phase to determine its performance.

Senator LEVIN. Has it been declared operational, do you know, yet?

Admiral CARGILL. No, sir, not yet.

Senator LEVIN. The environmental tests are going on, as I understand it, is that correct?

Admiral CARGILL. Yes, sir, biological and ecological studies are going on, which are to be completed in 1991, rather extensive studies.

Senator LEVIN. And will there be measurements and evaluations after those tests, or will they end when those tests are completed?

Admiral CARGILL. Yes, I am told there will be.

Senator LEVIN. They will go on after that?

Admiral CARGILL. Yes, sir.

BLUE-GREEN LASER

Senator LEVIN. Just a quick question on blue-green laser. Can you give us a status report on the laser communications program?

Admiral CARGILL. Yes, sir. We have pursued this program for quite some time, beginning originally with solid state and then, as some gains, some breakthroughs, were made in high-grain receivers for gaseous lasers in both blue and green, we analyzed and did considerable work and testing with gaseous lasers, [deleted].

There were successful. We have in the process analyzed the economics and the affordability of those developments and found that they are quite expensive. And in the process, additional technological breakthroughs have been made in the solid state area.

And so we have decided to continue our technological assessments at a level of effort type of program, rather than a development program, at this time. We have coordinated with DARPA now to join forces once again and pool our resources for 1989 and 1990 and on out through the existing FYDP to continue this developmental work toward solid state.

We feel that we do not want to go back toward gaseous, that we do want to pursue solid state. And as breakthroughs continue, if they continue to be as they have been in the last just 2 years, then we can go on to a full development.

We also need to do engineering systems work, as well as the laser itself, and that needs to be done.

Senator LEVIN. The present course we are on, assuming things work reasonably well, what would be your estimates as to when we would have to make a decision on deployment of that laser?

Admiral CARGILL. This is about a 2-year process that we have planned for at the present time, working with DARPA.

Senator LEVIN. And then if you decide in 2 years that the technology is there, how many years would it take us to deploy it if we decide to?

Admiral CARGILL. Well, because we do not know what we will find in the next 2 years, I would hesitate to say what breakthrough might be made and then how fast that may allow us to develop a space-qualifiable system.

Senator LEVIN. Would you predict that we will have a blue-green laser system in place by 1995? Just say likely or unlikely? Give us a prediction.

Admiral CARGILL. Unlikely, very unlikely.

Senator LEVIN. How about the year 2000?

Admiral CARGILL. It is feasible, yes, sir.

Senator LEVIN. Likely or unlikely?

Admiral CARGILL. Affordability is the major detriment at the present time.

Senator LEVIN. So you have serious doubts as to whether we will have a blue-green laser in place even by the year 2000, because of affordability?

Admiral CARGILL. That is an awful long time, Senator.

Senator LEVIN. I agree.

Thank you very much. That is far enough for a user of blue-green laser to see. Thanks.

Senator EXON. Thank you, Senator Levin.

Admiral, let me douse a little bit of the blame that undoubtedly will be coming the Navy's way. Many years ago when "di-di-dah-dit" was part of amateur radio, I was an amateur radio operator, and when anything happened in the neighborhood it was always Jim Exon and his transmitter over there who caused it. And undoubtedly that is going to be the situation in Michigan.

I can help you out some on that, Senator Levin. I was thinking about that the other day when I was out in my backyard with two electric prongs. We have a secret formula in Nebraska for bringing nightcrawlers up out of the ground. It is very secret. [Laughter.]

But I have never told anybody that I have that, because when I am out there crawling around with my prongs getting worms out of the ground I think that the neighbors must wonder what is going on over there.

But I will be glad to come up and demonstrate that.

Senator LEVIN. I am wondering if you should even talk about this in closed session.

Senator EXON. Well, this is a closed session, a highly secret meeting. [Laughter.]

Otherwise I would not be revealing these secrets.

Gentlemen, your testimony has been very helpful to us today. Please give us as early a response as you possibly can to the questions that will be submitted for you to reply for the record. And please keep us advised as things go along, because, as you know, this committee is very, very much interested in what you are doing and intend to be as helpful in the future as we have in the past.

Thank you all very much, and we are adjourned.

[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR J. JAMES EXON

COMMERCIAL LAUNCH POLICY

Senator EXON. On the one hand, we have a commercial policy inherited from the Reagan Administration. General Piotrowski, on the other hand, has established the goal of having uniformed military personnel eventually take over the preparation and launch of space boosters. As a matter of policy, where should we be drawing the line between procuring commercial launch services on the one hand and "in-house" launches by uniformed military personnel on the other hand? Aren't these two policies at odds in the long run for DOD payloads? As a matter of policy, should we permit the Navy to use commercial-type launch services for the UHF Follow-on?

Dr. SCHNEITER. I do not believe that we necessarily need to draw a line between procuring commercial and "in-house" launches. What I believe is more important is developing the criteria from which we can determine the most cost-effective option that does not jeopardize national security interests. We may, in fact, find that there may be a mix on both sides of the "line". For example, for systems whose architecture and constellation are suitable for launch on schedule, a commercial launch service may be appropriate. For systems needing launch on demand to react to changing world conditions, failure or enemy action, military launch may be needed. If so, maintenance of a dependable military launch capability would need to be exercised routinely and might therefore launch satellites otherwise suitable for commercial launch. However, that assumes we have developed a launch system with operational characteristics, and not one having the characteristics of today's systems. As long as we maintain the flexibility to use the best option, and are not directed to a specific solution, I do not believe these policies are at odds. The Navy effort to use commercial launches for the UHF Follow-on should be permitted as long as it does not jeopardize national security interests and proves to be cost-competitive with DOD-procured launch systems.

General MOORMAN. You describe the world of space launch in terms of two extremes, purely military on one extreme and purely commercial on the other. In reality, there is a range of alternatives in between with varying degrees of government and contractor participation. We are exploring many of them in our ongoing procurement of expendable launch vehicles. The selection of an approach should not be a matter of a single policy but of the needs of the payload and user being served. The line between "in-house" and commercial launch should be drawn in much the same manner as the line between military airlift, civil reserve and contract charter flights. Where the mission needs of war-fighting commanders require launch flexibility and responsiveness in crisis and conflict, we should provide some degree of "in-house" launch. To maintain a viable, responsive "in-house" launch capability, we should exercise it routinely even if a commercial alternative might be available. For satellites with more survivable constellations and operations suitable for launch on schedule, a greater degree of contractor participation is appropriate. The entire range of policies is applicable to long term DOD launch needs. As a matter of policy, none should be pursued to the exclusion of the others.

BOOST SURVEILLANCE AND TRACKING SATELLITE

Senator EXON. I understand that General Herres is reviewing the requirements for the proposed Boost Surveillance and Tracking Satellite, which is intended to replace the current system for Ballistic Missile Tactical Warning/Attack Assessment as well as to satisfy SDI requirements. When will that review be completed and when can you provide the results to the committee?

Dr. QUINN. General Herres, throughout the Joint Requirements Oversight Council (JROC), is reviewing the tactical Warning/Attack Assessment requirements that are currently satisfied by the space-based Defense Support Program (DSP). These requirements have been approved by the JROC and incorporated into a Mission Need Statement (MNS). This MNS describes the mission to be performed, the threat and environment that the system must operate in, and the vulnerabilities of the current system to satisfy this mission. The MNS has been approved by the JROC and forwarded to the Defense Acquisition Board (DAB) for funding approved. This MNS does not contain detailed specifications from which to develop system designs, therefore U.S. Space Command is in the process of developing more detailed specifications for Air Force system engineers. These detailed requirements are expected to be validated in July 1989.

The Strategic Defense System (SDS) requirements are also being developed by U.S. Space Command. These requirements, however, are expressed in terms of mission effectiveness (number of booster and re-entry vehicle kills), and are not broken

down into component requirements, such as early warning requirements. The Strategic Defense Initiative Organization (SDIO) is working with Space Command to develop an entire Strategic Defense System Architecture that satisfies the Space Command requirements. Milestones of the overall SDS design effort, which include early warning requirements as a subset, are: the Interim Requirements Review (March 1989), the System Requirements Review (March 1990), and the System Design Review (1991).

The DOD plans to satisfy the TW/AA and the SDS early warning requirements on the same platform (the Boost Surveillance and Tracking System (BSTS)). As described above, the TW/AA requirements will be approved relatively soon, but BSTS final system design will depend on the progress of the overall SDS architecture.

TRANSITION FROM DSP TO BSTS

Senator EXON. I want to tell you that the committee is increasingly uneasy about the lack of a comprehensive, agreed plan for making the transition from the DSP early warning satellite to the BSTS system. The DSP community seems busy making plans to buy DSP's for a long time while the BSTS program claims an IOC in mid-to-late 1990s. There is also no plan yet for the size and capabilities of the interim DSP constellation. Given that BSTS is scheduled to enter full-scale engineering development next year, isn't it time we hammered these issues out? When can we expect such a plan?

Dr. QUINN. A plan for transitioning from the Defense Support Program (DSP) to the Boost Surveillance and Tracking System (BSTS) is being developed. The essence of the plan is to make the transition on a regional basis vice as a turnkey operation. A turnkey operation essentially has both systems operating in parallel for a short time and then the entire DSP system (satellites and ground stations) would be turned off. A turnkey operation reduces risk, but is considerably more expensive in dollars and manpower.

At this time, it is highly probable that DSP satellite No. 26 will be needed, but the funding for this spacecraft will not be needed before fiscal year 1993. The transition plan from DSP to BSTS will be complete before the budget request for satellite No. 26 is submitted.

SPACE LAUNCH DEFICIENCIES

Senator EXON. Dr. Schneider and Dr. Quinn, if we tried to quickly correct all the problems General Piotrowski has identified, it seems to me that the costs would be enormous—prohibitive really. On the other hand, fixing these problems gradually, over time, will leave us in a vulnerable and deficient position for 15–20 years. Is this an accurate assessment of our dilemma?

Dr. SCHNEIDER. Yes, the assessment is accurate. However, the problems are not unique to the space area. We find this throughout the Department. With regard to space launch, we have initiated steps to overcome some of the problems he has identified. Some are fixed by developing new launch systems (e.g., ALS Pegasus), others by improving current launch capabilities, and the remaining by employing alternative strategies which lessen the need for responsive launch. We believe that we have a balanced program, given the available funds, to minimize our launch dilemma, and to do it in a manner that does not reduce mission capabilities.

Dr. QUINN. The assessment is correct, but can be amplified. General Piotrowski spoke of deficiencies in the wide-area surveillance mission that are being complicated by the advances in stealth technologies. These technologies have made detecting the threat a technical challenge as well as a fiscal challenge, and have compounded the dilemma. If there were funds available to acquire the systems needed to quickly correct the problems identified by Gen. Piotrowski, only part of the problem would be solved. Today, the technology is not available to implement solutions which are required for advanced threats. The dilemma is more than just a vulnerability/money problem; it also requires time to develop workable solutions. The Air Defense Initiative (ADI) is chartered to develop these technologies.

LAUNCH SOLUTIONS

Senator EXON. In principle, in this time of fiscal austerity, should we place higher priority on fixing the current deficiencies General Piotrowski has identified, or on developing new space capabilities?

Dr. SCHNEIDER. New space capabilities in the launch area would alleviate many of the launch deficiencies General Piotrowski identified. However, we must tradeoff the benefits of new capabilities versus planned product improvement to our current

fleet. In the near-term, it may be more appropriate to improve current launch vehicles. We should realize that this only provides some marginal utility, and that we cannot evolve these systems to that which General Piotrowski says he needs and, at the same time, reduce costs.

Dr. QUINN. New space capabilities will alleviate many of the current deficiencies that General Piotrowski has identified, primarily in the coverage area and detection of advanced threats. Current programs, such as the Air Force and the Navy Over-the-Horizon Backscatter (OTH-B) radars, also alleviate some of these deficiencies. It would be unwise to abandon these efforts in mid-deployment for the chance of early realization of new space capabilities. There are two reasons for this: first, it is unwise to depend solely on space-based systems from a vulnerability aspect, and second, the U.S. is currently vulnerable to today's Soviet threat. We are deploying the OTH radars to detect today's atmospheric threat. Abandoning these efforts creates a window of opportunity for an attacker and would leave the U.S. vulnerable to today's threat for quite some time.

AIR DEFENSE INITIATIVE [ADI]

Senator EXON. Dr. Quinn, it is my understanding that the bulk of the funds requested for the air defense initiative are intended for an airborne radar concept. An airborne platform cannot be on-orbit in sufficient numbers at all times to provide reliable Tactical Warning/Attack Assessment of an air attack. In fact, an airborne system would require a tip-off or a cue from some other warning system and is useful primarily to prosecute an intercept. And yet very few funds in the ADI request are for wide-area tactical warning. The committee has for several years admonished the Department that the first priority of the ADI research program must be tactical warning. The current program does not seem to support that priority. Could you please explain why—and why this committee should support the requested program?

Dr. QUINN. The ADI program was commissioned [deleted] to pursue air defenses complementary to the ballistic missile defenses being investigated by the SDI program. It is aimed at detecting and defending against advanced low-observable cruise missiles and bombers [deleted]. To achieve a meaningful "proof-of-principal," DEM/VAL test of a next-generation airborne surveillance aircraft is expensive. Due to the high priority of the Tactical Warning/Attack Assessment mission, the ADI program has allocated approximately one-third of its funds against this problem.

[Deleted.]

UHF FOLLOW-ON SATELLITE

Senator EXON. Could you explain how the EHF add-on package proposed for the UHF Follow-On communications satellite can be pursued without disrupting the multiyear procurement we approved last year?

Admiral CARGILL. The fundamental purpose of the UHF Follow-On program is to provide continuity of UHF service. Consequently, the UHF multiyear contract focuses solely on the required UHF capability. The addition of EHF does not bring about any change in the UHF requirements or capability and, therefore, has no impact on the multiyear contract.

Senator EXON. Last year the committee expressed skepticism that the Navy could procure commercial launch services for the UHF Follow-On cheaper than the Air Force could provide such services. Could you provide us with a detailed cost comparison and any arguments in favor of proceeding with commercial launch services even if it is somewhat more expensive? If you want to wait until the DAB review of this issue this summer is complete and provide an answer at that time for the record, that would be fine.

Admiral CARGILL. The Navy will provide you with an answer for the record after the DAB review of the issue.

Senator EXON. According to recent Navy testimony before the House Appropriations Committee, the Navy no longer intends to include launch services in the UHF Follow-On multiyear procurement. Did you make this decision in order to show that the multiyear meets threshold savings criteria? Do you still intend to accept delivery of the satellites on orbit as presented to the Congress last year?

Admiral CARGILL. The launch services were not included in the multiyear contract because the savings were not sufficient to justify multiyear procurement of launch services. Under the multiyear contract, the Government liability has been limited to the satellites since that is the portion of the program which reflected sig-

nificant cost savings. The total savings were \$56 million. Yes, the Navy still intends to accept delivery on orbit.

STRATEGIC C³

Senator EXON. Admiral Cargill, how does the Navy intend to implement the block upgrade for the TACAMO strategic communications aircraft fleet while ensuring that the fleet is ready at all times to perform its mission?

Admiral CARGILL. The Navy's plan is to maintain adequate force levels to carry out the TACAMO mission during the block upgrade integration in the E-6A. Each E-6A aircraft will be taken off service for about a 90 day period while the block upgrade is installed and tested.

The addition of the 16th aircraft to the inventory allows for one air-frame to be involved in some phase of depot maintenance, RTD&E or block upgrade installation without adversely affecting required force levels.

Senator EXON. Admiral Cargill, my assumption is that the TACAMO aircraft fleet will not survive for more than a few days in the event of a nuclear war. To what extent will the Navy therefore rely on MILSTAR for enduring connectivity to residual SSBNs and SSNs? Does the Navy intend to use MILSTAR to transmit initial emergency action messages as well?

Admiral CARGILL. [Deleted.]

Senator EXON. Admiral Cargill, the Wisconsin Extreme Low Frequency communications array has been operational since 1986. The additional Michigan array is almost operational. Yet we have only 12 test receivers deployed with the submarine fleet. Why haven't the receivers kept pace with transmitters and when will you catch up?

Admiral CARGILL. Full scale engineering development model transmitters were used for development and will serve as the operational transmitters. Because there are significantly more receivers to procure, a competitive production phase was required.

Prior to awarding the competitive production contract, a full operational evaluation was conducted in 1986 on the full scale engineering development model receivers. The results were evaluated, a Milestone III production decision was made on June 4, 1987, and the production contract was awarded to GTE on January 29, 1988. This accounts for the difference in timing.

Production deliveries for the ELF receivers will begin in November 1989, at a nominal rate of 10/mo. for a total of 153.

MILITARY SATELLITES

Senator EXON. Is it realistic to expect the National Space Program to compromise on technical performance? Alternatively, is it realistic to think we can afford two sets of systems? Finally, would you agree that fundamentally we will have to be content with modifying national assets over time to make them more survivable and more responsive to military needs?

General MOORMAN. The alternatives are not really "either/or." [Deleted.] Where appropriate, the DOD has provided additional funding to add capabilities to national systems to increase their military utility. These additions have included [deleted]. While we will continue to work toward achieving even more effective tactical use of our national space systems and ensuring that they will meet appropriate, validated military needs in peace, crisis and conflict, we have come a long way already.

However, this does not mean that modification of national systems is the solution to all military needs. Clearly there are cases where tradeoffs between technical performance and military utility would argue in favor of retaining the high levels of performance we have now, and in many cases improving them to meet future needs. Unfortunately, as with most other systems, maintaining very high levels of technical performance in a very hostile environment—war—can be extremely expensive and sometimes impossible.

In some areas it may be necessary to field separate systems that provide complementary capabilities: one with the required technical performance and survivability commensurate with peacetime and crisis needs and the other with performance balanced with survivability commensurate with regional conflict or war. This is not a new or unrealistic approach: it is essentially what we do today in the area of military communications. We field the Defense Satellite Communications system that is capable of carrying enormous amounts of information. [Deleted.] MILSTAR will carry much less information, but with virtually assured survivability, each with its own strengths and limitations.

In summary, I don't believe there is a single answer to meeting our national security space needs. It is clear that our systems, military and national security, have made major contributions for three decades in preserving peace. It would make little sense to sacrifice the ability to preserve peace to obtain the capability to support war. However, it is just as clear that space-based force enhancement functions are essential to terrestrial warfighting and that we must ensure these capabilities are available to the tactical and strategic forces when and where they are needed, regardless of the level of conflict. This can best be accomplished by modifying systems where that is technically feasible and economically affordable, and by fielding complementary systems where the validated need warrants the expense.

MILSTAR

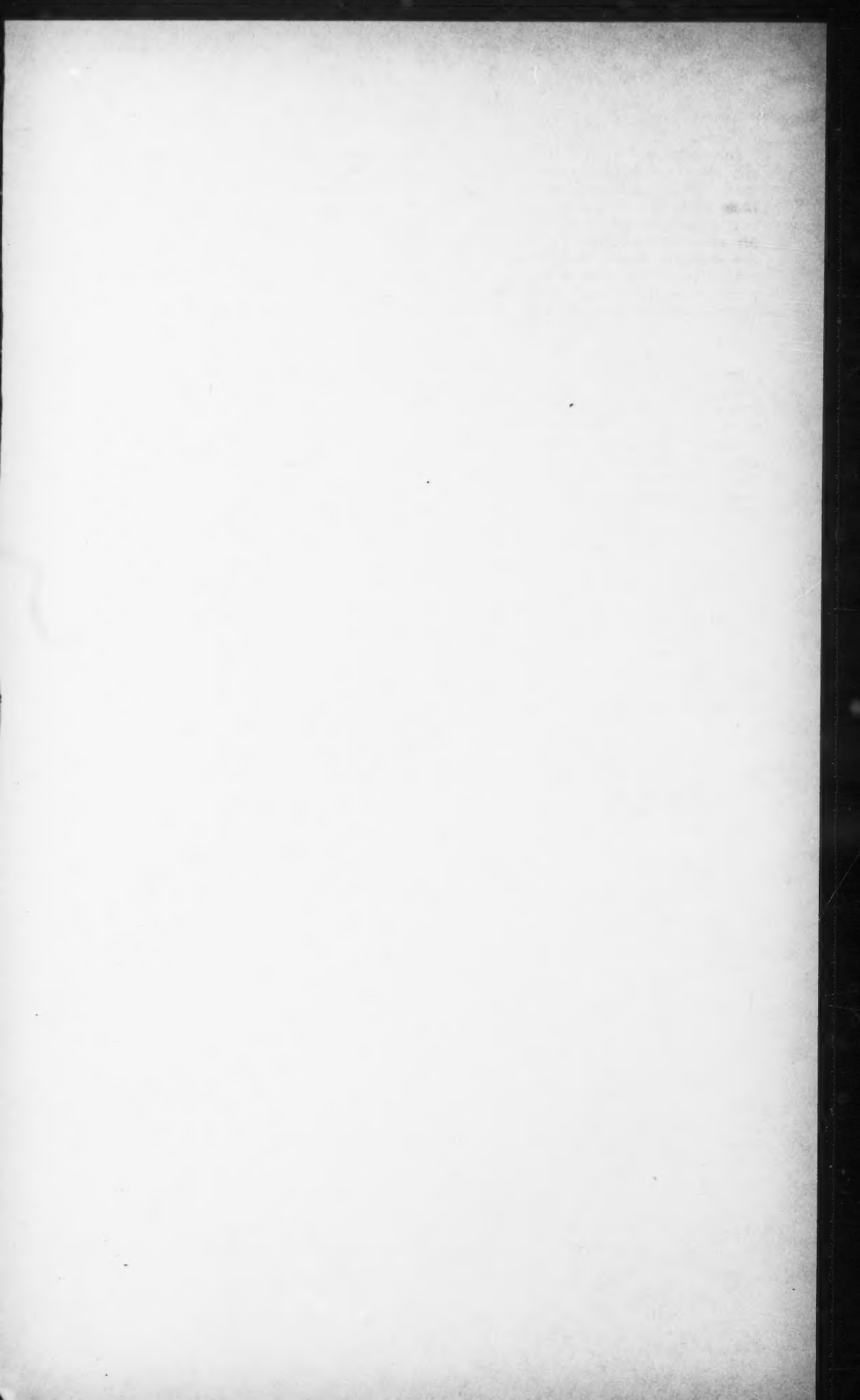
Senator EXON. We do not have MILSTAR-like communications systems today and yet I'm sure you feel that we should be able to communicate effectively with our strategic forces to execute the SIOP. Why, therefore, is MILSTAR critical to our strategic posture? What are the alternatives to MILSTAR?

General MOORMAN. MILSTAR will overcome growing deficiencies in current U.S. command and control communications. For instance, the present ability of the National Command Authority (NCA) to execute the SIOP relies on a wide range of communications systems (including Air Force Satellite Communications (AFSATCOM) system, Emergency Rocket Communications System (ERCS), Single Channel Transponders (SCTs), and Ground Wave Emergency Network (GWEN), each of which is primarily a one-way communications systems and has its own vulnerabilities in the amount of information exchanged, or in jamming susceptibility or nuclear weapons effects. MILSTAR will ensure meaningful two-way information can be passed through jamming, high-altitude Electromagnetic Pulse (EMP), and nuclear weapons blackout.

The MILSTAR contributions to our strategic posture are many. First, the MILSTAR system as planned will be unique in providing global Low-Probability-of-Intercept (LPI) coverage without ground relays. [Deleted.] Additionally the LPI would enhance the connectivity and survivability of mobile command posts and ground terminals. Second, the system will have a high level of jam-resistance and relative immunity to nuclear propagation effects. [Deleted.] Fifth, MILSTAR will operate more reliably during the transattack phase of a nuclear conflict due to its ability to operate through nuclear detonations and overcome the effects of nuclear scintillation. And last, MILSTAR is designed to endure through the post attack phase to assist in reconstitution of forces.

Given MILSTAR's unique capabilities and the growing threat, there are currently no acceptable alternatives.

[Whereupon, at 4 p.m., the subcommittee was adjourned.]



**DEPARTMENT OF DEFENSE AUTHORIZATION
FOR APPROPRIATIONS FOR FISCAL YEARS
1990 AND 1991**

THURSDAY, JUNE 8, 1989

**U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC FORCES
AND NUCLEAR DETERRENCE,
COMMITTEE ON ARMED SERVICES,
*Washington, DC.***

CHEMICAL DETERRENT PROGRAM

The subcommittee met in executive session at 2:06 p.m. in room SR-222, Russell Senate Office Building, Senator J. James Exon (chairman of the subcommittee) presiding.

Committee members present: Senators Exon, Nunn, Thurmond, Wilson and Gorton.

Committee staff member present: Lucia M. Chavez, Security Control Officer.

Professional staff members present: Robert G. Bell and William E. Hoehn, Jr.

Minority staff members present: Romie L. Brownlee, deputy staff director for the minority; and Brian D. Dailey, professional staff member.

Committee members' assistants present: Jeffrey B. Subko, assistant to Senator Exon; Kenneth N. Luongo, assistant to Senator Levin; Charles C. Smith, assistant to Senator Dixon; Milton D. Beach, assistant to Senator Glenn; James M. Bodner, assistant to Senator Cohen; Dudley L. Carlson, assistant to Senator Wilson; and Robert M. Soofer, assistant to Senator Gorton.

OPENING STATEMENT OF SENATOR J. JAMES EXON, CHAIRMAN

Senator EXON. Good afternoon, gentlemen, and welcome to you. This afternoon the subcommittee will receive testimony on the chemical deterrence program in review of S. 1085, the DOD authorization bill for fiscal years 1990 and 1991.

We will begin the hearing in closed session today, but it is my intention to open it as soon as we can. Today we will hear from two panels. The first panel will address an important but largely overlooked part of NATO's chemical deterrent posture, and that is the decision by President Bush to accelerate the removal of our existing chemical weapons stockpile from Germany. This decision was announced by Secretary Baker in Vienna in March.

The witnesses on this panel are Roger Harrison, Deputy Assistant Secretary of State for Politico-Military Affairs; Robert G. Joseph, Deputy Assistant Secretary of Defense, Nuclear Forces and Arms Control Policy; and Brigadier General Robert E. Linhard, Deputy Director for Strategy and Policy, J-5, Joint Chiefs of Staff.

I propose that we proceed first with Secretary Joseph, followed by General Linhard, who will present a classified briefing on the current status of planning for accelerating the removal of chemical weapons from Germany and the problems which the Joint Chiefs and the Defense Department have identified if the President's initiative is to be carried out on an expedited timetable.

We will remain in closed session while we question General Linhard and Secretary Joseph on specific issues related to this retrograde operation, questions that are of a classified nature and can not and should be handled in open session. I would like to reserve the testimony on and questioning about policy implications of this decision—why President Bush elected to do this, what the pros and cons are and so forth—for open session.

For that reason, I would ask Secretary Harrison to hold his opening statement, if he will, until we are in open hearing. I would ask all members to withhold their questions on the policy aspects of the decision until we complete the closed session.

I would point out that it is my understanding that the statement that we are going to receive from Secretary Harrison is not classified and is of a public nature. After we have an opportunity to question our first panel in open session, I will call on the second panel to testify.

I would expect that this panel be conducted completely in open session, although some questions may touch on classified information. Some of it might have to be answered for the record and maybe we could save time by handling it in that fashion.

The second panel will review the highlights of the administration's request for fiscal years 1990 and 1991 for chemical demilitarization programs and the development and procurement of chemical protective equipment and retaliatory weapons. The witnesses will be Dr. Billy Richardson, Acting Deputy Assistant Secretary of Defense for Chemical Matters, and Mr. Michael W. Owen, Principal Deputy Secretary of the Army for Installations and Logistics.

My good colleague, Senator Thurmond, is here with us. We are glad to have you. Senator Thurmond, I was wondering if you have any opening remarks.

Senator THURMOND. Thank you, Mr. Chairman.

Mr. Chairman, I join you in extending a warm welcome to the witnesses. Chemical weapons are a vital component of the NATO deterrence posture. While the United States unilaterally halted production of chemical and biological agents in 1969, the Soviets initiated a CBW modernization program of enormous productions. Many of the new Soviet CBW agents are known to us.

We may not have an effective antidote to protect our troops in Europe. Indeed, it is worth noting that the President's recent treaty compliance report states that the Soviet Union is in violation of the Biological Weapons Convention. This, in conjunction with past Soviet noncompliance with the Geneva Protocol, which

bans no first use and transfer of chemical agents, is most disturbing.

Current and past Soviet practice in the area of arms control compliance and chemical production are important reasons why I have supported and continued to support our chemical modernization program. However, we must not only ensure that the chemical deterrent is both effective and credible but also that our troops are equipped with the most modern chemical and biological defensive equipment.

I am troubled by the fact that the chemical and biological defense program request for this year was cut during the Bush budget review. At a time when the President is negotiating aggressively a total ban on chemical weapons and when over 20 countries are thought to be in possession of chemical weapons, some of which have used them illegally, it seems imprudent to cut spending on protective equipment.

I am also apprehensive about the recent announcement by Chancellor Kohl regarding a new American plan to accelerate the withdrawal of chemical weapons from Europe.

[Deleted.] Chancellor Kohl announced that the United States will try to accelerate that schedule to possibly 1990.

It is not clear why the United States is accelerating this schedule. The Soviets have not reduced their chemical munitions in Europe, from the information I have received; indeed, the Warsaw Pact has an unquestionable overall superiority in chemical munitions, delivery systems and defensive capability.

Moreover, if we are trying to negotiate a chemical weapons ban, why are we taking away an incentive for the Soviets to negotiate seriously, namely the existence in Europe of our chemical deterrent. These unitary chemical weapons are the most safe and reliable in the American stockpile. Does it make sense to remove them at this time and risk the danger, for example, of an accident because we did not adequately train and plan for their removal due to the acceleration of the program?

Mr. Chairman, I look forward to the testimony and hope that some of these issues can be clarified. Thank you, Mr. Chairman.

Senator EXON. Thank you very much, Senator Thurmond. Before we proceed now with Secretary Joseph, who I will recognize to proceed as he sees fit, since this is a highly classified matter I would ask staff to advise the Chair and certify for the record at this time that the committee staff members in attendance for this session are properly cleared. Mr. Joseph, I would ask you to certify for the record that accompanying DOD and OSD staff in attendance at this closed session are properly cleared. You have a very large contingent in attendance today and I have no way of knowing whether they are properly cleared or not.

Mr. BELL. Mr. Chairman, I can so certify that committee staff are properly cleared.

STATEMENT OF HON. ROBERT G. JOSEPH, DEPUTY ASSISTANT SECRETARY OF DEFENSE FOR NUCLEAR FORCES AND ARMS CONTROL POLICY

Mr. JOSEPH. Mr. Chairman, we can so certify.

Senator EXON. I am advised that even though we have a very large attendance today everyone in the room is cleared and was checked by proper authority as they came in the room. With that assurance, we will proceed. Welcome once again to you, Mr. Secretary. Please proceed.

Mr. JOSEPH. Thank you, Senator. I am very pleased to have the opportunity to testify today before you.

The retrograde of United States chemical munitions from Germany is a very important event both politically and militarily. I would like to make three introductory remarks.

First, let me say that the Secretary of Defense is fully committed to the President's goal of removing weapons in advance of the [deleted] date. In doing so, one guiding principle which has been agreed by all concerned is that we will not compromise safety or operational security in any phase or aspect of the operation.

Second, I would like to inform you that a retrograde concept plan has been developed, that this plan has been sent to the National Security Adviser. [Deleted.]

Third, I would like to emphasize the point that you made, Mr. Chairman, and that is the sensitivity of the retrograde operation, and I would ask that all questions associated with the retrograde be asked in closed session.

With those points, I would like to now turn over the floor to Brig. Gen. Robert Linhard. General Linhard, as you said, is the Deputy Director for Strategy and Policy on the Joint Staff, J-5.

Senator EXON. Thank you very much. General, please proceed.

**STATEMENT OF BRIG. GEN. ROBERT E. LINHARD, DEPUTY
DIRECTOR FOR STRATEGY AND POLICY, JOINT CHIEFS OF STAFF**

General LINHARD. Thank you, sir. I am very honored to brief you on the plan to date for the retrograde of chemical munitions from the Federal Republic of Germany. I hope that the slides will do well at this distance. I wish we were a little bit closer.

PUBLIC LAW 99-145 (1986 DOD AUTHORIZATION ACT)

- **CHEMICAL DEMILITARIZATION**

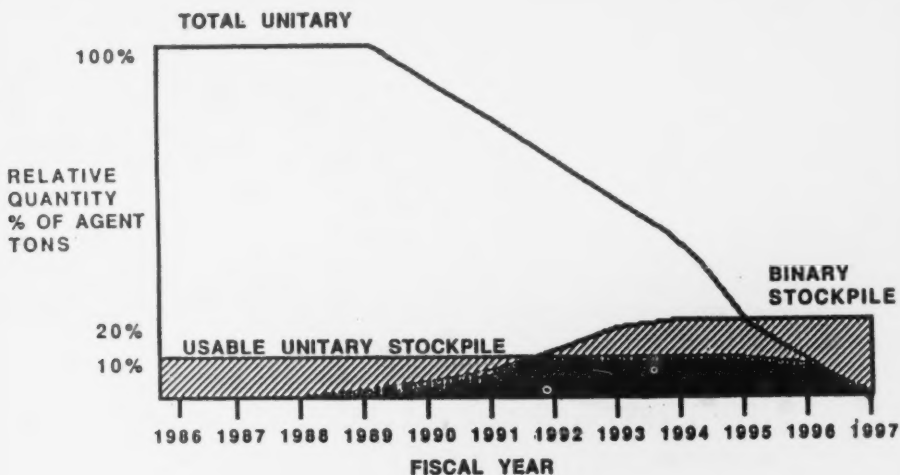
- **COMPLETE BY APR 97**
- **10% SECDEF DEFERRAL**

- **BINARY MODERNIZATION**

- **NATO CONSULTATION**

The 1986 Defense Authorization Act, Public Law 99-145, addressed two key aspects of the U.S. chemical weapons program. The law mandated demilitarization by 1994 of our aging unitary chemical stockpile and approved binary modernization to support NATO's chemical retaliatory force plans. Amended by 1988 legislation, the destruction of aging unitary chemical munitions has been directed for completion by April 1997, except for 10 percent of the stockpile which the Secretary of Defense is authorized to defer until an adequate number of binary weapons are procured.

DOD CHEMICAL PROGRAM



COORDINATED STOCKPILE DESTRUCTION AND MODERNIZATION PLAN

As you know, the Joint Chiefs of Staff consider only 10 percent of the unitary stockpile to be militarily useful. Generally this is the amount which will be deferred from destruction and includes the munitions currently stored in Germany.

Congress authorized the replacement of our unitary stocks with modernized, safer, more flexible binary weapons. The 10 percent setaside will allow a transition from the unitary to binary without a critical diminishment of our readiness and our chemical retaliatory capability.

REAGAN - KOHL AGREEMENT (May 86)

- (U) NO FORMAL DOCUMENT (SHULTZ MESSAGE)
- [REDACTED]
- (U) CONDITIONS:
 - BINARY PRODUCTION START - DEC 87
 - ADEQUATE BINARY CW STOCKPILE IN US

To obtain approval for binary modernization, as Congress required us to do, NATO confirmed the force goals, stating the need for binary chemical retaliatory capability. The force goal specifies short, medium and long-range binary systems, which translates into the 155 millimeter artillery projectile, the binary warhead for the multiple-launched rocket system, and the Bigeye bomb.

Germany was instrumental in gaining support for this force goal among our allies in NATO. As a companion action, to gain support from the FRG, President Reagan and Chancellor Kohl agreed at the 1986 Tokyo economic summit that the United States chemical munitions stored in West Germany would be removed [deleted] for eventual destruction.

Their agreement was based on the condition that production of the binary 155 artillery munitions begin in December 1987 and that the timing of the removal would depend upon the availability of adequate binary stockpile.

Senator EXON. General, can I interrupt you right there for clarification purposes? I take it, then, that the Reagan-Kohl agreement that you are referring to now has been endorsed in toto and an expedited suggestion has been made by the Bush administration? Is that a fair statement?

General LINHARD. Yes, sir, that is.

Senator EXON. Thank you.

General LINHARD. The degree of acceleration, I think, will come out further, but acceleration has been discussed by the administration.

ADEQUATE BINARY CW STOCKPILE IN UNITED STATES

(JCS, 20 Sep 88)

[Deleted.]

This chart outlines the Joint Chiefs of Staff approved definition of an adequate binary stockpile. When the initial Kohl-Reagan

agreement was struck in 1986, the binary modernization program provided for full production of all three systems by [deleted]. Thus, our assessment was the retaliatory forces would be modernized when retrograde was executed.

Currently, sufficient 155 millimeter projectiles, [deleted] should be produced to meet the objective. And the Bigeye bomb should be scheduled for production in [deleted]. However, program changes have occurred and the multiple-launched rocket system, [deleted].

The concept for retrograde is to complete the retrograde operation in four phases, as shown on this rather busy chart. [Deleted.]

RETROGRADE OF UNITARY CHEMICAL STOCKPILE OVERALL PROGRAM

<u>PHASE</u>	<u>EVENT</u>	<u>NOMINAL TIMELINE</u>	<u>RESP</u>
[deleted]	[deleted]	[deleted]	[deleted]

The retrograde operation itself should take approximately [deleted] and will involve [deleted]. The Army was appointed the executive agent and has been developing plans for this operation since 1987.

The Army has held a series of bilateral discussions with the—
Senator WILSON. Just a quick question, General. Why is it that the fourth step, that of disposal, in effect disarming those, occurs as the fourth rather than the first?

General LINHARD. We are talking, sir, about under legislation. This would be the 10 percent of our current existing unitary stock that the Secretary is authorized to hold as long as he can, in effect. In a sense what we are doing is taking these assets out of Germany, due to, as we will discuss later, the developing situation, and at the same time moving them to Johnston Atoll. But our destruction and demilitarization program, which you will be briefed on in open hearing later, will focus first upon those older assets which are less militarily effective.

Senator EXON. Thank you, Senator Wilson. Please proceed.
[Chart Deleted.]

General LINHARD. The Army has held a series of [deleted] discussions [deleted] on technical aspects of [deleted] of the current plan. The current plan calls for the Army to pack the [deleted] projectiles currently stored in Germany into airtight secondary steel shipping containers. These containers will then be loaded into international shipping containers called milvans. The milvans will be road-convoyed [deleted] and transported to the port facility [deleted] for sea movement.

[Deleted.]

PROPOSAL TO ACCELERATE

SECSTATE BAKER VIENNA ADDRESS (6 MAR 89) "NEW HORIZONS IN EUROPE"

[Deleted.]

ARMY CONCEPT PLAN SUBMITTED 30 MAR 89

Risks outlined; no recommendation on date for acceleration.

Identified resources (estimate \$43m).

Interagency involvement needed in planning process.

In March of this year, Secretary Baker announced that the President had directed that we seek ways to accelerate the removal of chemical weapons from Europe. Although the Joint Chiefs of Staff did not formally participate in the decisionmaking process, the Chairman was consulted and reviewed the initiative. His conclusion, after reviewing the 1986 decision and the Army's concept, was withdrawal [deleted] was feasible, but that there were operational risks associated with acceleration. [Deleted.] The Joint Chiefs of Staff approved the Army's concept plan on 5 April, and this was then forwarded to the Office of the Secretary of Defense for approval. As of this hearing, the plan [deleted].

The plan does identify the risks associated with early retrograde, outlines also the resource requirements and identifies assistance needed outside the Department. [Deleted] the NSC directed us to assume no increased funding for fiscal year 1989 or for fiscal year 1990. To date the Army has estimated the entire retrograde operation will cost approximately \$43 million.

ENVIRONMENTAL ASSESSMENTS

- RETROGRADE REQUIRES A SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT
 - JOHNSTON ATOLL HAS AN APPROVED EIS
 - SUPPLEMENTAL FOR STORAGE AND DEMILITARIZATION QUANTITIES
 - SEA MOVEMENT REQUIRES A "GLOBAL COMMONS" ASSESSMENT

I would like you to understand that the munitions currently stored in the FRG should not present any problems during a retrograde operation. With this as a background, we have begun those actions necessary to meet the applicable Executive Orders as well as the Federal and international environmental laws.

The current plan requires a supplemental environmental impact assessment for Johnston Atoll due to an increase in the quantity of munitions to be stored on the island, as well as an increase in the demilitarization quantities at the island itself.

Additionally, we will be required to prepare an assessment for the sea movement. An Executive Order requires a global commons environmental impact statement, and this is being developed. Completion of these assessments will be a key factor in any retrograde.

IMPACT ON CW DETERRENCE

- IMPACT ON EARLY WITHDRAWAL IS SAME 
- MILITARY SOLUTION WOULD BE TO ALWAYS DEPLOY CAPABILITY NEAR FORCES
- STILL AVAILABLE, BUT MAL-POSITIONED MUNITIONS 

- BINARY MODERNIZATION IS KEY TO CW DETERRENCE

The impact of early withdrawal presents the same operational considerations as did our previously-agreed-to date [deleted]. Obviously there are operational and deterrence impacts on withdrawing these munitions.

From a pure military point of view, we want the chemical weapons deployed as close to their needed locations as feasible. [Deleted.] Thus, we assess that as a result, the weapons themselves will be mal-positioned for a NATO scenario, which adds a time and logistics impact on retaliation options.

[Deleted.]

Our assessments also continue to stress the need to modernize, not just for the NATO contingency but also in the context of the global threats that have emerged. As you know, the Joint Chiefs of Staff have supported a position that binary modernization with CONUS storage is more desirable than continued forward development of aging unitary munitions. So the removal is not in disagreement with the established policy.

In sum, there is an operational risk associated with early withdrawal. We must accept these risks if the President decides to remove the weapons early.

This completes my presentation. I thank you for the opportunity to brief this afternoon. Quite honestly, when we get through with the discussion of the risks, the most important step that we can take is to make sure that we maintain, we believe, the support and momentum of the binary modernization program.

Thank you.

Senator EXON. Thank you, General.

Mr. Harrison, let us proceed with you before we have questions. Did you have any thing you wished to add?

**STATEMENT OF ROGER G. HARRISON, DEPUTY ASSISTANT
SECRETARY OF STATE FOR POLITICO-MILITARY AFFAIRS**

Mr. HARRISON. No, Mr. Chairman, I have nothing to add to what the General has said. But I might in closed session raise a point that Senator Thurmond made in his opening statement.

He mentioned that Secretary Baker has used the year 1990 as a possible goal for the retrograde action to be completed.

Senator THURMOND. Could you speak a little louder?

Senator EXON. I do not think these microphones are on.

Senator THURMOND. You will have to speak louder.

Senator EXON. We just have them there for effect.

Mr. HARRISON. Senator Thurmond used the year 1990 and said that Secretary Baker had referred to 1990 as a possible terminus for the retrograde program. In fact, the Secretary has not used that year publicly, and no spokesman of the Government has used the year 1990 in public statements. [Deleted.]

So I just wanted to clarify the record on that point, Mr. Chairman.

Senator EXON. Thank you very much. I have some questions.

Senator THURMOND. Mr. Chairman, did not Chancellor Kohl use that date?

Mr. HARRISON. Chancellor Kohl has used that date publicly, yes, he has, Senator.

Senator EXON. That is a good question, let's pursue that a little more. As I understand it there must have been some misunderstanding between what Secretary Baker proposed and what Mr. Kohl agreed to, but I think in closed session we can generally assume that one of the reasons for expediting this was to provide both the United States and our German friends an opportunity to try and seize the initiative to some extent from the Soviets in this particular area.

As much as anything else, this was a public relations gesture on our part; is that correct?

Mr. HARRISON. I think, Mr. Chairman, that one of our incentives certainly was to try to influence the political dialogue in Europe about chemical weapons, and one of the incentives for moving forward on that was our perception that indeed Gorbachev had gotten a lot of credit for simply following policy lines which we had laid down and that we were losing our constituency in Europe to maintain the sort of binary deterrent, which although minimal is nevertheless, we feel, absolutely necessary.

Senator EXON. Well, we are going to get into more of this through the questions, some of it in open session. I want to defer as much as is possible for the open session.

I am sure that it is on the minds of many Senators, as well as my own, that is fine to take these weapons out, but what does pulling out of these types of weapons do to the strength of our forces and the protection of our forces which will still be forwardly-deployed without any deterrence?

UNITARY CHEMICAL ARTILLERY SHELLS

General Linhard, let me ask you a series of questions about your presentation. How many unitary chemical artillery shells are now

forward-deployed in West Germany? What is their condition? How will you move the shells out of Germany? I think you covered that to some extent with the little map that you showed.

As I understand it, part of it will be by truck, [deleted] to port. Who picks these shells up at port and what storage capability exists at Johnston Atoll to hold the shells in safekeeping until the destruction activities that you alluded to would begin?

General LINHARD. Yes, sir. The first question was what is the size and condition of our stockpile currently in the Federal Republic. The United States chemical retaliatory stockpile in the Federal Republic today consists of approximately [deleted]. Virtually all the munitions we are talking about in Germany are maintained in a fully serviceable combat-ready condition.

The second part of your question is how we are going to move these physically. As the little cartoon in our briefing said, there is the United States loading them into vans, [deleted].

Senator EXON. United States vans or German vans?

General LINHARD. I believe right now they are U.S. vans.

Senator EXON. [Deleted.]

General LINHARD. [Deleted.] And again this is a concept plan, sir, and I would note that it has not yet quite been approved by the President.

From that point, it is my understanding that they will move [deleted] to the port [deleted] and [deleted] they will be loaded on [deleted] ships, basically container ships, for below-deck storage in the specialized containers which help us fulfill the requirements of international law. And then they will be moved by sea to Johnston.

Senator EXON. These ships are American ships? Is this U.S. Navy, Coast Guard? What are they?

General LINHARD. I believe they will be commercial ships; however, we have not selected the type ship to date. We have reviewed Military Sealift Command controlled ships, Ready Reserve Fleet ships, and commercial ships.

Senator EXON. Commercial ships?

General LINHARD. Yes, sir, the most feasible vessel would be a commercial container ship under contract to the Military Sealift Command. Regardless, whichever type ship is selected, security, with appropriate military force, will be in place to ensure it is protected.

Senator EXON. Escorted? Are you talking about escort at sea now?

General LINHARD. As I mentioned in the briefing, sir, [deleted], yes, sir.

SECURITY

Senator EXON. And could you tell us a little bit more about the security? I am thinking of terrorist-type activity, both in the vans and on the rails, leaving from the railhead to the port. Have you worked out those details? You are working on that, I presume.

General LINHARD. Sir, I have absolute confidence to say that we will not make a motion that is either not secure or safe. But I have to tell you, sir, that I am not personally well prepared to tell you the details of the individual security arrangements.

Mr. JOSEPH. Sir, if I could just add to that point, the planning for the acceleration of the withdrawal, at least the concept plan, draws on work that we had already underway with regard to meeting the objective of 1992. We have worked with the German authorities and security has been one of the major areas that we have concentrated on.

We are taking all actions that are required, but we continue to work that as well as other aspects of the plan.

Senator EXON. Thank you. Back to you again, General. How long will the shells be kept in storage after they reach the atoll and what is the estimated cost of accelerating the withdrawal rate by over 2 years than what was earlier anticipated?

General LINHARD. As we discussed earlier, sir, this portion of the unitary stock, which is the most modern of our unitary stock, will likely be the last to be demilitarized. The operation will be complete, by legislation, no later than 1997. Storage on Johnston Island will be required for those munitions until that date, partially from the point of view of when the facilities become available for demilitarization and partially depending upon the world situation.

The costs involved for the overall retrograde operation are about \$43 million. The most recent changes in cost are more driven, quite honestly, by fact of life changes in the fact that since the initial plan has been made we have had environmental law changes and we will have had changes that have caused us, for example, to go from one ship movement to two ship movements, which drive a portion of those costs.

OVT AT JOHNSTON ATOLL

Senator EXON. I ask that question for several reasons, because I think we want to get a handle on this. I would simply ask you to comment on a May 5 statement of this year by then-Under Secretary of Defense Costello, when he informed the Congress that there is going to be a 7-month delay in the completion of the operational verification test or OVT at the Johnston Atoll Chemical Agent Disposal System due to software bugs and personnel recruitment problems.

The OVT is not scheduled to begin its operation until March 1990. We were advised it will take 16 months to complete. When the administration decided to accelerate the removal of chemical weapons from Germany, did it know, did it understand, and has it dealt with the Johnston Atoll disposal facility which is experiencing some delays?

What has been done, if anything, to overcome this obvious shortfall?

General LINHARD. We have, of course, in the next panel, I believe, more expertise on the exact status of the facilities at Johnston Atoll that we use for the demilitarization. However, it is my understanding that right now we have in the Army plan, and now the DOD plan to the President that addresses feasibility, that the adjustments, provided they go as currently understood, to the demilitarization capability on Johnston Atoll should not drive—should not be the limiting and driving factor.

What we are trying to do now is to make sure that we are not operating on the margin, that in fact even with the slippage in the operational verification test that we will not in fact make a commitment that would drive us into an unsafe, imprudent or insecure action.

I am not an expert on the demilitarization facility itself. I do know that we do have those on hand who can discuss it in open session.

Senator EXON. My basic question is have we addressed what appears to this Senator to be a potential problem here? That is why I asked about how long it was going to take out there on Johnston Atoll as to what we are going to do and how we are going to do it.

Could you submit for the record an answer to my question in that regard?

General LINHARD. We certainly can, and in addition, sir, I would like to make sure. We will submit, of course, the direct answer to your question. We have considered the impact and although perhaps my own personal background is not one that can give you the technical details, I can assure you that we have looked at this problem and we believe that, provided the program maintains on schedule, that this has an impact but the impact is controllable and it is being factored in.

We will provide whatever other information we can.

[The information follows:]

From the outset of planning withdrawal of munitions, the storage considerations at Johnston Atoll have been addressed. The initial planning guidance was to [deleted] the storage and security of the munitions being withdrawn. [Deleted.] At present, the conforming storage requirement can be met by rewarehousing the munitions scheduled for disposal and storing the retrograde munitions into vacated space. [Deleted.]

Senator EXON. Thank you. My time has expired. Senator Thurmond.

Senator THURMOND. Thank you. Mr. Chairman, I want to request that the reporter make a correction—where I used Secretary Baker to put Chancellor Kohl. Chancellor Kohl did make the statement to the Bundestag on April 27, 1989. It read this way. This is what Chancellor Kohl said: "President Bush has announced accelerated unilateral withdrawal of all chemical weapons from the Federal Republic of Germany by the end of 1990."

That is the statement and I ask that the record be corrected accordingly.

Mr. Harrison, how did Mr. Kohl come to believe President Bush would remove these chemical weapons by 1990?

Mr. HARRISON. [Deleted.]

But if the question is whether he used the date 1990 because there was an agreement between the German and American Governments on 1990 as the terminus for the retrograde, there is no such agreement.

ACCELERATION OF THE CHEMICAL RETROGRADE PROGRAM

Senator THURMOND. General Linhard or Mr. Joseph, I might ask you this question. Was the Joint Chiefs of Staff and the Office of Secretary of Defense consulted about Secretary Baker's announcement regarding acceleration of the chemical retrograde program?

If so, when were you consulted and what input did you have in the formulation of the Secretary Baker's announcement?

Mr. JOSEPH. Sir, I can say that Secretary Taft, who was the Acting Secretary of Defense last March, was consulted on both the question of the retrograde as well as the specific date in question, the end-1990 date. I believe the Chairman was also consulted because I know they had several discussions between them and with others in the Cabinet on this issue.

I believe both advised against establishing the 1990 date as a commitment and in fact we did not establish any commitment of an end date for retrograde. I understand that Secretary Taft did express certain reservations about the problems associated with early withdrawal, and I believe those problems have been generally recognized as presenting the possibility of delay in any schedule that we may come to agree.

Senator THURMOND. Thank you. General Linhard, do you have a comment on that?

General LINHARD. Senator, from the point of view of the Joint Chiefs, the Chairman and the Secretary discussed it as early as about the second. The announcement actually occurred on or about the 6th. Although they had talked about the situation with chemicals before, this idea of acceleration was discussed at that time.

There was discussion between the Chairman and the Chief of Staff of the Army. As I had indicated in our testimony, though, the Joint Chiefs of Staff formally did not participate in the decision process. The Chairman did review, was aware of the initiative, expressed reservations, explained that reservations were setting a specific date objective, and provided that input to the Secretary of State into this process prior to the announcement, sir.

Senator THURMOND. General Linhard, can you assure the committee that safety, training and planning for the chemical retrograde program will not be compromised by our attempts to accelerate the program?

General LINHARD. Senator Thurmond, without any doubt at all, the U.S. military will not conduct an operation which is unsafe or unsecure. That would be a showstopper.

Senator THURMOND. What training procedures have been set up to meet the new proposed date to implement the retrograde?

General LINHARD. Senator, I am very aware of the physical security devices that we will use with respect to unit training. I am afraid I do not have a comment on that at this point. I just do not know the details myself of that.

Senator THURMOND. If you want to submit anything for the record on that, feel free to do so.

General LINHARD. Thank you, sir. I will.

[The information follows:]

Training is a major part in the preparation to retrograde these munitions. The military units supporting the operation will undergo intensive training. The training ranges from practice in loading the secondary shipping containers, operating the special test and diagnostic equipment, practicing the various aspects of decontamination, rehearsing the security aspects at the various sites and along the movement routes, to reviewing the emergency medical aspects. The medical community will undergo specialized training in treatment of nerve gas casualties. Additionally, the Germans have developed a plan to train their key personnel. Examples include firefighting, treating gas casualties, and conducting a national command and control

exercise involving both German and U.S. to train the key personnel in the in-place communication system and developed emergency response procedures. The crew of the ship(s) selected as well as the supporting security forces will be equipped and trained to handle emergency situations involving the munitions. I am confident that adequate training will occur to prepare the people involved with this operation.

U.S. CHEMICAL MUNITION STORED IN EUROPE

Senator THURMOND. Mr. Joseph, in the fiscal year 1988 DOD authorization bill Congress stated that United States chemical munitions stored in Europe should not be removed unless such munitions are replaced contemporaneously with binary chemical munitions on the soil of at least one European member nation of NATO. That is a quote, I believe, from that law.

Has there been any progress in finding a European country that will store the new binary munitions?

Mr. JOSEPH. Senator, the current plan is, of course, to remove from our site in Germany, all of the unitary munitions. We intend to store the new binary weapons in the United States. In peacetime we will not have storage in Europe. We will have, of course, arrangements for the introduction of these munitions into Europe such that they can contribute in both a deterrent and warfighting sense.

Senator WILSON. Excuse me. May I interject a question right here?

Senator THURMOND. Let him finish that and that will be all right.

Mr. JOSEPH. I was going to add, with the withdrawal of the unitary systems and the storage of the binary in the United States, I believe we will have some degradation in the deterrent and warfighting contribution. However, I think as we build the binaries—and this is, I think, the most important message that we have today—as we build the binaries and as we achieve a sufficient number of binaries, we will be in a better situation with having binaries in the United States rather than having the unitary weapons forward-deployed.

Senator THURMOND. Senator Wilson wanted to ask a question.

BINARY STOCKS TO BE STORED IN UNITED STATES

Senator WILSON. Thank you very much, Senator Thurmond. The question I had was really an extension of Senator Thurmond's question. We understand that most of the binary stocks are to be in the United States, but I gather from what you just said that they all are, and the earlier slide showed by General Linhard in detailing what would be an adequate stockpile of chemical components [deleted] of 155 millimeter ammunition.

Is that not to be deployed with those batteries in Europe?

Mr. JOSEPH. The binaries will not be deployed in peacetime in Europe.

Senator WILSON. In other words, the entire binary stocks will be in the United States, which means effectively that we have no on-the-ground capability in Europe.

Mr. JOSEPH. Yes, sir.

Senator WILSON. Thank you. Thank you, Senator Thurmond.

Senator THURMOND. I do not think I have gotten your answer to my question yet. I will be back in a few minutes. My time is up.

Senator EXON. Go ahead, Senator. Your time is up, but let us get the answer to the question.

Senator GORTON. I do not have any questions. I will yield my time to Senator Thurmond.

Senator THURMOND. The law says this in the fiscal 1988 DOD authorization bill: U.S. chemical munitions stored in Europe should not be removed. It does not say "shall not" but says "should not be removed unless such munitions are replaced contemporaneously with binary munitions on the soil of at least one European member nation of NATO."

Now the question I propounded to you was this: Has there been any progress in finding a European country that will store the new binary munitions?

Mr. JOSEPH. Senator, I would have to say that there has been no progress, but in order to give you a complete answer, I would have to say that I am unaware of any plans.

Senator THURMOND. That is the way I construed what you said, but it seemed to me you kind of circumvented the question when you answered it.

Mr. JOSEPH. Sir, that is why I want to follow up, because I think, to give you a complete answer, I do not believe that there is an attempt ongoing to secure the permission of any European NATO ally.

Senator THURMOND. There should on your part, since the word "should" was used instead of "shall". It says "should not be removed". I guess you could construe it either way. But, at any rate, the intent of Congress I think was as I stated.

That is all. Thank you, Mr. Chairman.

Senator EXON. Thank you, Senator Thurmond. Senator Wilson, did you finish?

Senator WILSON. No. Thank you, Mr. Chairman.

REAGAN-KOHL AGREEMENT

From what you have set forth today, the Baker speech, the "New Horizon" speech in March in Vienna was an amendment to the Reagan-Kohl agreement, and the amendment was an acceleration without a date being specified, but Kohl has subsequently publicly identified 1990 as the effective date.

The first question is, are we going to be able to meet the timetable set forth in General Linhard's slide about an adequate CW stockpile? Are we on schedule for that? Are we going to be able to have the [deleted] of 155 millimeter by March 1990?

General LINHARD. Sir, as indicated, by 1990 we will be able to get the [deleted] 155 millimeter rounds. That was one of the first of those three items that we identified. Unfortunately, the second item was the multiple-launch rocket system, in fact, as I indicated in my briefing, [deleted].

Senator WILSON. So the first element we will have?

General LINHARD. The 155 millimeter we will. The Bigeye, with your good help, will be in introduction by [deleted] but the MLRS [deleted].

Senator WILSON. Now let me pursue the point that Senator Thurmond was making. The report language in that authorization bill 2 years ago clearly indicated the feeling on the part of the two committees and the feeling of Congress that binary is a definite improvement, but that there should not be a complete withdrawal of the unitary stocks there without replacement, one-for-one, on European soil with the binary improved munitions.

Why was that admonition shoved aside?

Mr. HARRISON. Senator, I think that the decision not to proceed in that way was made in the Reagan-Kohl agreement where there was agreement to remove the stocks from Germany by [deleted].

Senator WILSON. Wait a minute, Mr. Harrison. Let us remember the timeframe. The Reagan-Kohl agreement was made in May 1986. I am talking about the 1988-89 authorization.

Mr. HARRISON. I understand that, but the point I am making is that this is not a function of the acceleration decision but, rather, a function of the original Reagan-Kohl agreement.

Senator WILSON. Are you saying that as part of that agreement it was agreed that there would be not only removal, but removal on a unilateral basis without replacement?

Mr. HARRISON. I am saying that it was agreed there should be removal by [deleted] and there was no expectation on our part that the German Government or, indeed, any other government in Europe would allow us to station binary munitions on its soil.

Senator WILSON. I want to get to the next question. Is there any evidence, any information available that our potential adversary, the Warsaw Pact, has engaged in any kind of similar or plan any similar withdrawal?

Mr. HARRISON. There have been some statements by spokesmen of the Warsaw Pact that there will be such withdrawals and destruction. The Soviet Union has constructed some destruction facilities, but we have no concrete evidence to indicate that these reductions or destruction have begun.

Senator WILSON. And has there been any announcement of a timetable on their part?

Mr. HARRISON. They have not made an announcement of a timetable, no, sir.

Senator WILSON. Is that not a critical fact? I mean, even if we assume that they are going to do it, that they in good faith, their announced intention, is there not a rather considerable window of vulnerability on our side if the timetable on our side is much earlier than that for the Warsaw Pact?

Mr. HARRISON. One of the purposes of our acceleration initiative was in fact to try to bring public focus and therefore pressure to bear on the Soviets to make good on some of these pledges they have made and therefore to begin some Soviet destruction.

Senator WILSON. So in effect we are engaging in a unilateral act in the hope of embarrassing them into following suit?

Mr. HARRISON. I think I would put it that we are trying to exploit a step which we had agreed to take and to use that step to bring public awareness to the fact that we in fact are leading the Pact on the chemical weapons issue in Europe and try to pressure the Soviets to follow suit.

Senator WILSON. I would simply point out that that is one way to look at it. Another way is that by going forward on an accelerated basis if they are not in good faith—and you do not have solid evidence that they are—you may be creating a different kind of incentive.

Mr. JOSEPH. Sir, there is no intention, at least within the Department of Defense, to take on good faith, Soviet statements that they will eliminate their chemical munitions. Our actions are keyed, I think, directly to the binary program as well as to questions of alliance management.

Senator WILSON. There is no question, Mr. Joseph, about the wisdom of replacing unitary with binary stocks. That we will stipulate, and that was stipulated to in the authorization bill 2 years ago. The question that is arising has to do with the fact that under the timetable that is now being proposed we would so accelerate that removal that we would in fact find ourselves with no capability in Europe at a time when the Soviets and the Warsaw Pact continue to maintain one.

That I call a window of vulnerability. Let me ask you whether the Defense Department has finalized its timetable for distributing Bigeye to the services. Did I understand that is [deleted].

VOICE. Yes, that is correct. That will be the beginning of production deliveries, Senator.

CRYOFRACTURE PROGRAM

Senator WILSON. Congressional direction has consistently supported cryofracture as an alternative for safe disposal and last year \$16.3 million of 1989 funds were appropriated specifically for the cryofracture program but since then it has halted, I believe halted on October 1, 1988. Why is that?

Senator EXON. Let me say to the Senator that I have no objection to taking this right now. That was a matter we were going to get into in more detail in the open session.

Senator WILSON. That is fine. I would be happy to defer it.

Mr. JOSEPH. And I think with the next panel, I believe.

Senator WILSON. All right. I will defer until then, Mr. Chairman, and will with the next question.

Senator EXON. Thank you, Senator Wilson. Senator Gorton, do you have any questions?

Senator GORTON. No.

Senator EXON. I just have one last question and then hopefully we can go into open session.

C-141 AND C-54 MISSIONS

Mr. Secretary, how many C-141 and C-5 missions would be required to airlift an inventory of 155 millimeter binary shells equal to [deleted] of warfighting capacity, and in connection therewith has there been any thought at all given to the possibility of positioning ships outside of the NATO waters to carry these 155 millimeter shells to expedite their entry into Europe?

Mr. JOSEPH. Sir, if I could, I would like to take those questions for the record. I cannot answer those at this point.

[The information follows:]

Each CINC has been apportioned chemical munitions for planning. The logisticians in the various commands have included the movement of apportioned stocks in reinforcement plans. Current planning for the deployment of chemical munitions includes both air and sea movement. For the record, a 463-L pallet is the standard metal skid used to load our aircraft. The C-141B is loaded with 13 of the pallets and the C-5B loads 36. 96 each 155mm rounds are loaded into a single pallet and 42 each 8-inch rounds. A C-141B will hold approximately 1248 155mm or 546 8-inch CW artillery projectiles. [Deleted.]

Senator EXON. Thank you. Are there further questions of this panel?

[No response.]

Senator EXON. If not, thank you very much, gentlemen. You are excused. We will now move into open session. We may have some additional questions for this panel that should have been asked in closed session. If so, we would appreciate your responding for the record as promptly as possible, gentlemen. Thank you.

We will reconvene in 1 minute in open session.

[Whereupon, at 3 p.m., the subcommittee adjourned.]

OPEN SESSION

Hearing Reconvened

The subcommittee reconvened in open session, pursuant to notice, at 3:04 p.m. in room SR-222 Russell Senate Office Building, Senator J. James Exon (chairman of the subcommittee) presiding.

Committee members present: Senators Exon, Levin, Thurmond and Gorton.

Committee staff member present: Lucia M. Chavez, security control officer.

Professional staff member present: Robert G. Bell.

Minority staff member present: Brian D. Dailey.

Committee members' assistants present: Jeffrey B. Subko, assistant to Senator Exon; Kenneth N. Luongo, assistant to Senator Levin; Milton D. Beach, assistant to Senator Glenn; James M. Bodner, assistant to Senator Cohen; Dudley L. Carlson, assistant to Senator Wilson; and Robert M. Soofer, assistant to Senator Gorton.

Senator EXON. The subcommittee will now reconvene in open session. Mr. Harrison, I believe we indicated we appreciate the fact that you have held your opening statement to this open session. We would ask that you please proceed at this time.

STATEMENT OF ROGER G. HARRISON, DEPUTY ASSISTANT SECRETARY OF STATE FOR POLITICO-MILITARY AFFAIRS

Mr. HARRISON. Thank you, Mr. Chairman. It is a pleasure to appear before this committee and its Subcommittee on Strategic Forces and Nuclear Deterrence.

These hearings come at a time of dramatic movement in the field of arms control. We have witnessed and we have been the catalyst for momentous events which will affect world peace and the security of this country for years and decades to come.

The key element in that unfolding situation is President Bush's initiative at the NATO Summit on conventional arms control in Europe. We have all been gratified, I believe, by the response to the President's initiative.

It is important in charting new ground for conventional arms control, but important as well because it dramatized a fact which had become obscured. I mean the leadership role the West has played in establishing the political and philosophical framework for security relations in Europe.

The facts are incontestable. The present negotiations on conventional force reductions and the negotiations on confidence building measures are based on our proposals and our agenda.

Our insistence on asymmetrical reductions to eliminate Soviet superiority in key weapons systems, for example, has been accepted by the East and is now the keystone to those talks.

Our insistence that the negotiations cover all of Europe from the Atlantic to the Urals is another illustration of how the West has set the ground rules, as is our long support for greater transparency in the negotiations on confidence and security building measures.

I raise these examples now to make a point. Although we have clearly set the pace for arms control negotiations with the Soviets, this fact has not always been clear to our public. Indeed, we have repeatedly seen examples of Soviet acquiescence to a Western position being portrayed as a new Soviet initiative.

There are many examples, but perhaps the most glaring is the credit the Soviets derived from General Secretary Gorbachev's acceptance of President Reagan's double global zero position in the INF negotiations.

The same has been true in the area of chemical weapons. As members of the committee are aware, it was the United States, in the person of then-Vice President Bush, that tabled at the Conference on Disarmament in 1984 a proposal for the total elimination of chemical weapons world-wide.

It was the United States that established the requirement for on-site, on-demand verification as a key—and now universally accepted—element in achieving such a treaty.

Moreover, it was the United States which unilaterally suspended production of chemical weapons in 1969, only to see the Soviet production continue, creating a huge modern arsenal of chemical weapons facing our forces and our allies in Western Europe.

It was the United States which instigated the Paris Conference on chemical weapons use which has done so much to focus world attention on this pressing problem and, we believe, to reinforce the norms against chemical weapons use established by the 1925 Geneva Protocol.

Still, in spite of our leadership on the chemical weapons issue, it was clearly the case earlier this year that our policy was either unknown or discounted by publics in Europe and in the United States. Therefore, we have taken and will continue to take steps which we hope will accomplish a number of objectives.

The most important of these is to push on in Geneva for the achievement of a global, effectively verifiable comprehensive ban on the production, stockpiling, transfer and use of chemical weapons and others to continue our efforts to halt proliferation of chemical weapons.

As the committee is aware, we are currently working with congressional staffs to develop legislation giving the President appro-

priate sanctions authority for use to help stem such proliferation. Since publicity and credibility are so crucial to these efforts, we have also taken steps to dramatize our efforts so that publics will understand both the opportunities and difficulties of chemical weapons arms control. Finally, we have sought to bring pressure to bear whenever we can on the Soviets to begin dismantling the huge CW arsenal which they now possess.

The President's pledge to seek ways in which to accelerate the withdrawal of chemical weapons from the Federal Republic of Germany should be seen in this context. As the committee is aware, there was an existing political commitment to withdraw these weapons by the end of 1992 in light of on-going binary CW production.

This was in response to the concerns of our German ally but it was not widely known, and certainly it had resulted in no public pressure on the Soviets to take a corresponding move. Accordingly, the President determined after consultation with allies, and in particular the German Government, to announce our intention to explore ways and means of accelerating CW withdrawal.

In announcing this decision in his speech at the Vienna Meeting of Foreign Ministers on March 6, Secretary Baker did not specify a date because, frankly, we were uncertain how soon the problems of transportation and storage of these weapons could be resolved.

But the Secretary did implement the other element of the Presidential decision by challenging the Soviet Union to respond to our announcement by accelerating the destruction of a vast CW stockpile facing Western Europe. Unfortunately, the Soviets have not responded. We intend to keep up the pressure on the Soviets to destroy their CW stocks and to continue our efforts to achieve a global CW ban.

President Bush has repeatedly emphasized his personal commitment and that of the administration to the elimination of chemical warfare and chemical weapons. Most recently at the NATO summit in May, he stated that, and I quote, "the alliance should support efforts to move ahead to an effectively verifiable global chemical weapons ban. We must achieve a chemical weapons ban as quickly as possible."

These are not idle statements. The administration wants to do all it can to bring home to publics here and in Europe our commitment to the President's goal.

I noted earlier the movement for greater progress in conventional arms control in Europe. President Bush led the way. We have taken the high ground. Our pursuit of chemical weapons reductions in Europe is a part of this overall movement.

The point is that we are leading the way and we are calling on the Soviets to match us with positive actions. We are already politically committed to the elimination of our chemical stocks in Germany. We have everything to gain in accelerating the process now, if feasible.

In fact, the positive effect of such an acceleration serves our foreign policy and national security interests in other areas of arms control policy as well. Progress in one area promotes progress across the board.

Thank you, Mr. Chairman, and I would be happy to answer any questions.

CHEMICAL WEAPON STOCKPILES

Senator EXON. Mr. Harrison, thank you very much. Let me start with a general question, we have had a whole series of chemical weapons votes in the recent past. Many of the votes were 51-49 or 50-50, and the Vice President had to break a tie on many of these votes.

Now, with all that, we seem to be on the verge of removing all of the deterrent that our stockpile of chemical weapons have and we used to think was necessary in Europe. I suspect that it is safe to say that this is done primarily not because we would like to have it that way but because our German allies are objecting to this.

Whether that is good or bad from an overall standpoint, I see that, coupled with the fact that we are supposedly going to reduce the chemical defensive equipment, the lifesaving mechanism, that are afforded our troops almost simultaneously with pulling out the deterrent. The fear of retaliation therefore is eliminated.

Does that not leave our forces in Europe in somewhat of a naked position?

Mr. HARRISON. Mr. Chairman, speaking personally I certainly would not support any diminution in the protective equipment for our forces in Europe. I think that provision of protective equipment to them is absolutely essential and will remain essential even after we have achieved a chemical weapons ban.

Senator EXON. The administration is not proposing that we reduce that?

Mr. HARRISON. Well, Mr. Chairman, you mentioned that earlier. It was the first I had heard about that and I was making a personal comment about the need for protective equipment. I think it is important to have protective equipment and I am sure the administration—I know the administration shares that view.

CHEMICAL BIOLOGICAL DEFENSES

Senator EXON. I would simply call your attention, then, and I would hope that you would check into this, under the amended budget request from the Department of Defense, page 136, chemical biological defenses.

The cuts are outlined and the explanatory data connected therewith, and I quote, "reduces the survival collective protection system from 44 to 28 units in fiscal 1990 and from 55 to 27 units in 1991." If you do not have an explanation for that, then I wish you would see that it is submitted for the record. It is something I wish you would check into.

STATEMENT OF ROBERT G. JOSEPH, DEPUTY ASSISTANT SECRETARY OF DEFENSE (NUCLEAR FORCES AND ARMS CONTROL POLICY)

Mr. JOSEPH. Sir, the only explanation I would have on that, speaking from the perspective of the Department of Defense, is that while we give increased attention and priority to defensive

measures, we also have to make very hard tradeoffs, particularly in the current budget environment.

If I could return to your earlier comment, we are intending to remove from at least the status of forward deployed, all of the chemical weapons munitions in Europe. We will, with the existence of sufficient binary munitions, continue to maintain a deterrent against the use of chemical weapons.

DETERRENT AGAINST CHEMICAL WEAPONS

Senator EXON. How can we maintain the deterrent if we are taking out all of our retaliatory forces from Europe and reducing the protective gear? It seems to me that is not a very rational conclusion that you are trying to draw.

Mr. JOSEPH. Sir, the prohibition that will exist will be for the deployment in peacetime. We will not deploy forward in peacetime chemical munitions in Europe.

Senator EXON. Well, of course, that is the heart of deterrence. I am talking in a peacetime environment. I recognize—

Mr. JOSEPH. Sir, deterrence, of course, as you know relates to the perception of the enemy. If the enemy believes that you have a credible capability—and clearly, I do not think that there is any question that the credibility of a modern binary stockpile is much greater than the aging unitary systems than we currently have—then I would think it would be very difficult to calculate with any degree of certainty what the exact deterrent effect is on the part of the stockpile that we will maintain.

Senator EXON. Well, Mr. Joseph, I do not want to contradict you, but you and I do not seem to be functioning on the same wavelength in this area. I recognize—and that is why I asked some of the questions that you heard me ask in closed session—how long it would take to get this back in there.

I would simply state that if we are talking about deterrence, deterrence, especially with regard to chemical weapons, is influenced by a question that the other side must ask if they use chemical weapons, how long would it take us to retaliate?

Obviously, it is going to take us considerably more time to retaliate—a matter of not hours, but more likely days, if they should use chemical weapons. I am also very much concerned about the reference that I made to the Department of Defense's proposition of reductions in survival collective protection devices and measures.

It seems to me that given the budget crunch which we here know very much about also, that it is a double whammy in an area that to me does not make sense and I cannot understand.

It is correct that after the NATO Defense Planning Council approved a force goal for the U.S. production of binary weapons in 1986, six of our allies—namely Denmark, Greece, Holland, Iceland, Luxemburg and Norway—announced that they would never allow deployment of these weapons on their soil.

U.S. DEPLOYMENT OF BINARIES

It is also correct that the Federal Republic of Germany, Great Britain and Italy, declared that they retained a veto right over U.S. deployment of binaries on their soil in a crisis.

I guess what I am trying to do is to point out that while we may be well-intentioned to do this on a unilateral basis, it seems to me it is not wise.

Mr. JOSEPH. Sir, if I could. If your point is that it is better to have chemical weapons forward deployed than not to have them forward deployed, I certainly would agree.

But again, we are in an area of hard choices and if the choice is not between having binary weapons—if the choice, then, is having binary weapons forward deployed or having binary weapons deployed in CONUS, I certainly would agree with you it is better to have them forward deployed.

If the choice is having unitary weapons forward deployed or binary weapons based in CONUS, I would choose the second, both for deterrence and for war fighting.

Senator EXON. Well, let me go on and see if we can clarify something else that we addressed in closed session and we are going to be addressing further in this open session.

REMOVAL OF CHEMICAL WEAPONS FROM GERMANY

In Vienna, in March, Secretary Baker announced that President Bush had directed the new administration to explore—I underline the word explore—to explore ways to accelerate the removal of existing chemical weapons from Germany.

The removal of our existing chemical weapons, therefore, is the heart and soul of this matter and was the heart and soul of that announcement by the administration. Early removal of these weapons will require available safe storage and development of practical plans to destroy them.

Given that, does the Secretary's statement with regard to the President directing the administration to explore the ways represent a U.S. commitment to accelerate the removal of these weapons? Or on the contrary, is it a promise to make a good faith effort to see if such an acceleration is feasible?

If it is the latter, why do we not determine if it is feasible before announcing that we would try?

Mr. HARRISON. Well, Mr. Chairman, I think it is the latter. That is to say, it is not a commitment. It was very clear in the Secretary's statement that the effort to accelerate the removal was caveated by our ability to carry out that obligation, but my understanding is that there was some belief on the part of the Secretary when he made that statement that in fact we could accelerate. The question was, to what degree we could accelerate and that, as you know, has not yet been determined.

Senator EXON. If that caveat that I suspected exists—and you have just confirmed that—is that caveat understood by Germany?

Mr. HARRISON. It was certainly made clear to the German Government at the highest level.

Senator EXON. But Mr. Kohl's pronouncement seems to not take that into consideration. Or a stronger word may be, ignore it. Is that right?

Mr. HARRISON. Well, if you mean Secretary Kohl's public announcement that the CW stocks would be removed by the end of 1990—

Senator EXON. That is exactly what I mean.

Mr. HARRISON. All I can say about that is that it is not reflective of any agreement between the U.S. Government and the Government of Germany.

Senator EXON. My time is up on the first round. Senator Levin.

BINARY WEAPONS OVER UNITARY WEAPONS

Senator LEVIN. Thank you, Mr. Chairman. Mr. Joseph, you just said that you would rather have binary weapons here than unitary weapons forward deployed?

Mr. JOSEPH. If that is the choice, sir, yes.

Senator LEVIN. Was that the choice?

Mr. JOSEPH. I think it has become the choice, given the question of alliance management.

Senator LEVIN. Was it the choice when it was made? Were we required by anybody to remove those weapons, or did we just agree to that, unilaterally, without any concession to the Soviets? No treaty with the Soviets required us to do that, did it?

Mr. JOSEPH. No treaty with the Soviets, certainly, requires us to do that. We have done that unilaterally in the context of the alliance.

Senator LEVIN. To strip away all the diplomatic niceties, that was a unilateral action on our part.

Mr. JOSEPH. It will be a unilateral action on our part, yes sir.

Senator LEVIN. Without any reciprocity from the Soviets?

Mr. JOSEPH. Without anything reciprocal from the Soviets, that's correct.

Senator LEVIN. Did the last administration or this one call that unilateral disarmament?

Mr. JOSEPH. The last administration, in fact, accepted in the context of the Reagan-Kohl agreement of 1986, the withdrawal of all unitary chemical weapons munitions from Europe.

Senator LEVIN. Did they label that unilateral disarmament?

Mr. JOSEPH. Sir, I do not believe it is unilateral disarmament. It is withdrawing the chemical weapons from Europe and hopefully, we will not have unilateral disarmament. Hopefully, we will have full support for the binary program, such that we can retain a credible deterrent against the use of chemical weapons.

DESTROYING UNITARY WEAPONS

Senator LEVIN. Are we not going to destroy those unitary weapons?

Mr. JOSEPH. We will be destroying the unitary weapons.

Senator LEVIN. So you are saying that we had a good deterrent forward deployed which we are withdrawing without a reciprocal action on the part of the Soviets? We are destroying those weapons, but that is not unilateral disarmament?

Mr. JOSEPH. Well, sir, the timing for the destruction, particularly of those unitary systems that are the most effective and reliable and safe is yet to be determined and is linked directly to the production of the binary program.

CHEMICAL WEAPONS-FREE ZONE IN NATO

Senator LEVIN. Is the effect of this decision, which unilaterally withdraws those forward deployed chemical weapons, the creation of a chemical-free zone in NATO, while leaving Soviet chemical weapons in place in Eastern Europe?

Mr. JOSEPH. Sir, I really do not think of it in terms of a chemical weapons-free zone and the only position we have taken within the alliance is, we will not deploy these forward in peacetime.

Senator LEVIN. I know that is not the way you think of it, but is that not the effect of what we do?

Mr. HARRISON. I think if the meaning of your question, Senator, is that we could not station or introduce under any circumstances chemical weapons into Europe, no. That is not the case.

Senator LEVIN. That is not the question.

Mr. HARRISON. It is not a chemical weapons-free zone in that sense.

Senator LEVIN. It is a de facto chemical weapons-free zone in NATO, is it not?

Mr. JOSEPH. In peacetime?

Mr. HARRISON. No. I think we would describe it, Senator as maintaining a deterrent, a CW deterrent in binary form in the United States. There is no chemical weapons-free zone in Europe.

Senator LEVIN. Well no, if we pulled all of our nuclear weapons back to the United States and left them here, would we say that was a nuclear-free zone in NATO?

Mr. HARRISON. We certainly would not, no sir.

Senator LEVIN. You would not?

Mr. HARRISON. No, sir.

Senator LEVIN. I thought that that was what it was.

Senator EXON. Senator, could I interrupt just a moment? Our guests standing in the back of the room, I would invite you to take the chairs, if you wish, along the window. Right over here, if you want to, and make yourself more comfortable.

Senator LEVIN. I thought that was exactly the definition of a nuclear-free zone in Europe, if we pulled back nuclear weapons away from Europe to the United States?

Mr. HARRISON. No, sir. I think there are a lot of other things which would have to go into that, and the usual definition of a nuclear-free zone, or a chemical-free zone is one which has been negotiated between parties and in which chemical weapons are not—are agreed by the parties not to exist. That will not be the case.

Senator LEVIN. So if we unilaterally pulled back our nuclear weapons from Europe, that would not be a nuclear weapons-free zone?

Mr. HARRISON. If we renounced the use of chemical weapons or nuclear weapons, then I think that probably might be described as a nuclear weapons-free zone, or a chemical weapons-free zone. We have not done that.

Senator LEVIN. Not if we renounced it, we just simply pulled them back from Europe. That would not be a nuclear weapons-free zone?

Mr. HARRISON. That is a redeployment I think, Senator.

PROBLEMS IN ACHIEVING CHEMICAL WEAPONS TREATY

Senator LEVIN. One additional question. Mr. Harrison, can you give us the specific problems that still remain in achieving a chemical weapons treaty, prioritize them?

Mr. HARRISON. I think the chief problem, Senator, remains the verification issue. In fact, we are going to begin conversations again in the Conference on Disarmament on Monday, and on Tuesday we begin bilateral consultations with the Soviets aimed at resolving some of the remaining problems.

And they are considerable problems because of the ease with which chemical weapons can be produced and the problem of production which is clandestine and storage which is clandestine, the problem of maintaining an offensive capability by training for defensive actions and so forth.

Some of these issues have not been resolved, and frankly, at the moment, we do not know of solutions to some of them, but we are going to continue to explore. So that is one problem.

A second problem is maintaining security for both sides during the destruction period. The treaty foresees, I believe, a 10-year destruction period for these weapons, and, obviously, we want them to be destroyed in a way which will maintain the security of both sides during the destruction period so there is no period in that time when one side has an advantage. That is also a very delicate and protracted negotiation. I would say that is the other major problem.

There is also a problem of data. The Soviets have told us that they have 50,000 tons of chemical agent; we very much doubt that figure. We have to begin coming to grips with the idea, ways and means of verifying existing stockpiles, a job which I think will be made more difficult by the Soviet claim. So I think those are the three major areas now where we continue to have difficulties.

Senator LEVIN. Thank you. President Bush has stated that he is personally committed to eliminating the terrible scourge of chemical weapons from the face of the earth. Has the chemical weapons treaty become a higher priority in the Bush administration than it was in the Reagan administration?

Mr. HARRISON. No, because I think that our position since mid-point in the Reagan administration when then-Vice President Bush tabled the draft treaty on chemical weapons in the Conference on Disarmament has been precisely what you have just described.

Senator LEVIN. Thank you.

Senator EXON. Thank you, Senator Levin. Mr. Harrison, in your statement you say that the accelerated removal of these weapons will, and I quote, "contribute toward progress on our ultimate goal of the negotiation of a total ban on chemical weapons."

If, during the INF experience, we had decided to build the Pershing II and the GLCM missiles but kept them on soil here in the United States instead of stationing them in Europe, do you believe that that would have contributed to the negotiation of a ban of such INF systems that we recently were successful in negotiating?

Mr. HARRISON. Well, Senator, I think the standard answer is "I cannot address a hypothetical," but let me go on to say that it seems to me, that, unlike that situation, we have a problem of

credibility in Europe. We have a problem of eroding public acceptance of chemical weapons in any form.

We have managed to maintain a NATO commitment to CW deterrents, NATO support for the binary program. But that is being maintained by governments which find the support of their publics eroding day by day. The Soviets have exploited that fact by taking some initiatives; some we talked about earlier which have been given too much credit by European publics.

So it has put us on the defensive, and we have to worry about maintaining the political basis for our deterrent program. And I think that is what we are getting at and that is why we believe that this acceleration is going to be an aid in our policy.

BRITISH GOVERNMENT WHITE PAPER ON DEFENSE

Senator EXON. Let me turn to you, Secretary Joseph. The White Paper on Defense recently released by the British Government accuses the Soviet Government of lying in a number of recent statements about its chemical warfare activity.

For example, the report states "contrary to Soviet claims, we have good reason to believe that the Soviet Union has stationed chemical weapons in Eastern Europe." The report also states that "we strongly suspect that, contrary to Soviet claims, production of CW agents in the Soviet Union is still continuing and the testing of chemical weapons has not ceased." Do you agree with these assessments by the British Government?

Mr. JOSEPH. Sir, I do not think I can, in this session, give you my views on those particular items. I can say that I certainly agree with the general statement that the Soviets have not been honest in terms of an accounting of their chemical weapons activities, including production and current stockpile.

SOVIET RESTRAINT IN CHEMICAL WARFARE

Senator EXON. Well, do you see any indications of any Soviet restraint in chemical warfare in general in response to the earlier 1986 Reagan unilateral decision to withdraw the stockpile from West Germany or the 1989 Bush unilateral decision to accelerate that withdrawal? Do we have any scrap of evidence or hint, other than to what you referred earlier, when you were asked a question along these lines, and you said that Mr. Gorbachev had made some allusion on possible rhetoric in that connection. Is there anything other than that?

Mr. JOSEPH. Senator, there is nothing other than what they have said. There is no concrete evidence to support, in my view, the conclusion that they have restrained their program.

Senator EXON. Gentlemen, is it then fair to assume that this is a unilateral action on our part, the withdrawal? Is it a unilateral action on our part? In essence, we are doing this not because we think it is wise or not because we think it particularly strengthens our position or not that we really believe it is going to have any significant positive effect on the Soviets withdrawing, but primarily as a public relations gesture, mainly at the behest of the West Germans.

Mr. JOSEPH. No, I do not think I would agree with that characterization, Mr. Chairman. In fact, we think it is a wise move, the outcome of which has not yet been seen. We still may see some response from the Soviets; we have not seen any yet, but our program is not complete.

But we have witnessed over the past months and years the strength of public opinion in forcing the other side to begin some restraint on its military forces. And we have seen that in their conventional forces in the form of a Gorbachev conventional withdrawal.

So there is some evidence that, if we can build the credibility of our position in Europe, we can influence Soviet behavior. It is certainly our hope that this unilateral step, which is truly unilateral at the moment, does not remain unilateral; we hope for a Soviet response.

Senator EXON. Thank you. I am going to yield now to Senator Wilson. I thank you, Senator Wilson, for coming back out of another meeting. One of the questions that I was going to ask is something that you started to get into in closed session, and I refrained from asking that question because you had gotten into it first.

I am pleased to yield to you at this time for your round. I assume that you are going to get into the matter that we interrupted you on in closed session.

CONVENTIONAL DISARMAMENT/UNILATERAL CHEMICAL DISARMAMENT

Senator WILSON. Thank you, Mr. Chairman. I would be pleased to do that. However, I cannot resist the temptation, having heard your question, to pursue it just a bit. Let me just ask you why it is that we seem to be pursuing a diversion rather than a parallel line as it relates to what we are asking of the Warsaw Pact with respect to conventional disarmament and what we are doing with respect to unilateral chemical disarmament.

President Bush has just returned from what has been hailed as a very successful trip to Europe in which he was commended on all sides for having, in a very statesmanlike fashion, put down the gauntlet, saying that we are prepared to go forward with conventional disarmament, provided that the Soviets will go forward with a disarmament that is asymmetrical, but will, in fact achieve the kind of balance that was provided for us as a model in the INF agreement where they had to, because they had a larger inventory, disarm in a quantitative way to a far greater extent than we were required to do. The net in both cases is that we come to some reasonable balance of forces.

In this instance, and you can tell me it is because we made an agreement and I guess we cannot dispute a matter of historical fact, but in this instance we are departing from that, or you can say we did depart from it, but we are engaged in a unilateral action which we hope will produce a similar response from the other side.

It is one thing to hope and another to condition what will be a simultaneous disarmament on both sides. Is that an unfair characterization?

Mr. JOSEPH. No, I do not think it is, Senator, but I think that recent history has shown that both agreements and initiatives within the context of treaty negotiations and unilateral initiatives under certain circumstances can be effective in bringing progress on the arms control and security front in Europe.

So, I do not think that it necessarily follows because of the President's suggestion in the CFE for wide-range initiative to be negotiated, that unilateral steps cannot also be effective under certain circumstances, and we hope in this case that that will be true.

Senator WILSON. Mr. Harrison, I can only say that hope is one thing and simultaneous conditions are another. Not to be unkind, but it seems to me that wishing does not make it so in the ability to resupply. To move the binary stocks, when they are available, to actual deployment in the NATO theatre becomes problematical for a lot of reasons.

We are at a disadvantage with the Warsaw Pact in whatever retrograde we are talking about, they are in a position to resupply much more easily and much more certainly and much more rapidly than we. Even if you take into account the fact that presumably we will not be allowing them to do so unharrassed.

CRYOFRACTURE PROCESS

Let me get on to the questions that the chairman and I were sharing. I understand they have to do with the cryofracture process. We have in the Congress directed \$16.3 million in 1989 funds; we have appropriated that amount and directed that they be specifically employed for a cryofracture program to provide an alternative technology for safe disposal of chemical munitions. And yet, the program has been halted since October 1, 1988. Why is that?

Dr. RICHARDSON. Mr. Chairman, I can address that question now or cover it in the second panel, whichever you wish.

Senator EXON. Since Senator Wilson has been trying to accommodate us at this time, that, again, was going to come up in the next panel, Senator Wilson—

Senator WILSON. Yeah, I am sorry, I frankly thought, when I came back, that the next panel was up. I, unfortunately, cannot remain—

Senator EXON. Then the question is a good one. Would you please rise, state your name and we will put it in the record now and then we may go into this further when your time comes?

Dr. RICHARDSON. I am Bill Richardson. I am Deputy Assistant to the Secretary of Defense for Chemical Matters. I recently assumed that office. On the matter of cryofracture, of course, the administration position on that as stated by Deputy Secretary Taft last year, was that we did not feel we should proceed with that technology, even though we had initiated the effort on it.

The reasons were several; it seemed that considerable testing should still be done on it, and the scheduling would be such that we would only have a few months left at the installation site before completion of demilitarization at the time the cryofracture procedure would be ready.

I would add a recent event has happened on that. We had the National Academy of Sciences evaluate the cryofracture approach

and advise us. Their advice to us in a report submitted within the last month or so was that, indeed, we should not proceed with that technology. They cited concerns such as the large rotating kiln involved in that technology is unlike any which had been previously built. The splitting-off of resources to a second demilitarization effort and, thereby, spreading thin resources too thin.

I should say, too, that there has been mention of cryofracture as a back-up technology, but as we and the NRC panel looked at it, of about 17 procedural subsystems in the demilitarization process, 12 of those are common between the cryofracture approach and the JACADS, or Johnston Atoll Chemical Agent Demilitarization System that is the baseline system.

Senator WILSON. Well, simply stated, then, is it the position of DOD now that cryofracture has no future and that the process is one that we have discarded?

Dr. RICHARDSON. That is our position for chemical agent disposal.

Senator WILSON. I will not take the time now, Mr. Chairman. Perhaps Mr. Richardson could provide for the record a little refresher of the reasons that were stated by Secretary Taft. I take it, then, that—I am not clear from what you just said, but it sounded like you said that it is not even contemplated as worthwhile as a back-up technology.

Dr. RICHARDSON. That is our assessment of it, it would come along too late. But, also that much of the processing from start to finish in demilitarization is common between the two procedures, the baseline procedure and cryofracture, so that much of the area where you hoped to have a back-up capability, you would be looking for the same system that you're trying in the baseline system. I would be very happy to give you a more detailed lay-out of what I just mentioned.

Senator WILSON. I would be appreciative, Mr. Chairman, if we could get a response as to why the process has been abandoned and also what that means in terms of the monies that have been appropriated and also any facilities that have been reserved for that purpose.

Dr. RICHARDSON. Certainly.

[The information follows:]

DOD canceled the cryofracture program based on schedules, costs and limitations of the technology. When terminated, it was four years behind the disassembly and incineration technology used in the Johnston Atoll Chemical Agents Disposal System (JACADS). Virtually all of the major program decisions regarding design, construction and equipment acquisition and installation will be made for the JACADS clones at the eight CONUS sites before we could complete cryofracture development and testing.

The building and testing of the cryofracture plant (at Tooele, Utah) would have cost well over \$200 million. Assuming no delays due to problems with environmental impact, testing, scheduling, equipment production and safety, it would only operate about five months or less before all of the chemical munitions were destroyed at Tooele, Utah. To the DOD, investing in two technologies does not make good economic sense when the disassembly technology shows every sign of meeting or exceeding all requirements. The National Research Council, an independent organization, reached the same conclusions.

Even if the cryofracture program had matured at the same pace as the disassembly program, it still would have had additional limitations. First, it cannot handle bulk items (ton containers, bombs and spray tanks) which account for about 65 percent of the unitary stockpile. Second, it requires a cutting system, like the one in JACADS, to handle M55 Rockets. We have about 475,000 rockets at five CONUS

sites and Johnston Atoll. Finally, while the two systems use similar incineration, pollution abatement and monitoring technology, the cryofracture system would most likely have worse problems. Instead of the several smaller and more manageable incinerators used by the disassembly process, cryofracture will use one massive rotary kiln to incinerate agent, explosive charges and metal parts simultaneously. We have never tested such a method.

After analyzing all of these factors and recognizing the need to fund other important programs with our limited resources, we decided to terminate the cryofracture program.

Senator WILSON. Thank you, Mr. Chairman.

Senator EXON. Thank you, Senator Wilson. Senator Thurmond.

HONORING A CHEMICAL WEAPONS TREATY

Senator THURMOND. Mr. Joseph, if the United States is successful in negotiating a treaty that bans chemical weapons, would we implement that treaty if many non-Soviet, or Soviet-bloc countries, who are now in possession of chemical weapons, do not agree to sign the treaty and destroy their stockpiles?

Mr. JOSEPH. Sir, the criteria that we have established for a chemical weapons ban is, first of all, that that ban must be effectively verifiable—

Senator THURMOND. I cannot hear you—do what?

Mr. JOSEPH. The first criterion is that the ban must be effectively verifiable. It must also be global and truly comprehensive. If it is only in the context of a Soviet agreement to eliminate their chemical weapons munitions, that does not meet the criteria that we have established and therefore we would continue to require a chemical weapons retaliatory deterrent capability.

Senator THURMOND. So what you are saying, as I understand then, if Soviet bloc countries or non-Soviet countries who are now in possession of chemical weapons do not agree to sign the treaty and destroy their stockpiles, then we would not go along with it.

Mr. JOSEPH. Yes, sir.

Senator THURMOND. Thank you. That is a clear cut answer. Mr. Joseph, last year, the Congress provided the Department of Defense with \$6.8 million to conduct a program to develop and demonstrate compliance in monitoring the capability in the event the U.S. signs a treaty banning chemical weapons. Could you provide the committee with a progress report on this program?

Mr. JOSEPH. Sir, if I could ask Dr. Richardson, I think Dr. Richardson is prepared to respond to that.

Senator THURMOND. All right.

Dr. RICHARDSON. We have several initiatives ongoing in that area, Senator Thurmond. We are still seeking the best arrangement for efficient management of that kind of activity within OSD, but some of the things we have ongoing are a small effort that is financed, about one-half million dollars a year that has been exploring basic technology and approaches on verification.

We have also, within the last month, set up an office at the Chemical Research Development Engineering Center at Edgewood that is a treaty verification R&D office to look at that.

Another such initiative ongoing is that the Defense Nuclear Agency has a request for proposals out on the street now for would-be contractors to respond in the general area of verification, but including chemical treaty verification as part of that. Proposers were

to prepare white papers in seven areas to illustrate that they knew something of what they were proposing on, and two of those seven areas were the chemical business.

We are seeking a dialogue with the Arms Control and Disarmament Agency or ACDA, which serves an inter-agency coordination role among DOD, the intelligence services, and the Department of Energy. That is a bit of what is going on in that area. I hope shortly, though, to have a more formalized approach within USD for, as I say, the most efficient management of such an activity.

Senator THURMOND. Those are all the questions I have.

REMOVAL OF CHEMICAL WEAPONS FROM GERMANY

Senator EXON. Thank you, Senator Thurmond. Mr. Harrison, section 126 of the National Defense Authorization Act for fiscal years 1988 and 1989 reads as follows: "Chemical munitions of the United States stored in Europe on the date of the enactment of this act should not be removed from Europe unless such munitions are replaced, at the same time, with binary chemical munitions stationed on the soil of at least one European nation of the North Atlantic Treaty Organization."

When the Bush administration decided to accelerate the removal of our chemical munitions from Germany, what weight did it give to the sense of the Congress on this issue as expressed in the provisions in the law? And two, what, if any, efforts has the Bush administration made to persuade at least one of our NATO allies to accept peacetime storage of binary weapons on its soil?

Mr. HARRISON. Mr. Chairman, this decision was made by the President and his close advisors. They were certainly aware of the sense of Congress on the issue, but I cannot answer the question of what weight they gave to the sense of Congress in reaching their decision.

On the question of the efforts we have made, periodically in the past we have raised this question with our European allies. We find a great sensitivity in Europe to the issue of chemical weapons, which may, indeed, arise from the historical experience of European countries with the massive use of chemical weapons that has made our European allies unwilling to have CW weapons stored on their soil in peacetime. And we have seen over the past months and years no change in that position.

AMENDED BUDGET REQUEST

Senator EXON. Mr. Harrison, the Bush administration amended budget request for fiscal years 1990 and 1991 added \$29 million to the Reagan request to pay for the accelerated removal of the chemical weapons from Germany. Another \$15 million is being requested to be reprogrammed in funds for fiscal year 1989.

The amended request also reduced, I repeat, reduced funding by \$39 million in fiscal years 1990 and 1991 for purchasing of Air Force chemical survival collection protective systems, which provides shelter for up to 84 personnel at airfields. In a prepared statement which Dr. Richardson will present later to us here, he says that "Without such collective protection equipment, the Air Force bases cannot sustain operations in a chemical environment."

Let me repeat that. The Air Force bases cannot sustain operations in a chemical environment. Does it make sense to you to add over \$40 million to the budget to speed up the removal of chemical retaliatory weapons, while taking \$40 million out of the budget needed at our air bases in Germany, if they are not going to be able to operate in a chemical environment?

If we are not going to have a chemical retaliatory deterrent deployed in Europe, should we not be increasing the budget for chemical protective equipment? Or, to put it another way, if we are not going to have a chemical deterrent there, does it make any sense whatsoever to be decreasing, at least at this time, the protective equipment and gear that it seems to me would be necessary, and, rather than cut, should be expanded?

Mr. HARRISON. Mr. Chairman, I am a firm believer in the need for protective equipment and gear; there is no question of that. And I, however, am not aware of the considerations which led to that budget reduction that you have described. And if none of my colleagues are, perhaps we could take that question and submit it to you for the record.

Senator EXON. If you would answer for the record, we would appreciate it very much.

[Answer not submitted in time for printing.]

Mr. JOSEPH. Sir, let me add that it is my understanding that most of the funds to which you refer are associated with the withdrawal of the unitary stockpile from Germany which goes back to the 1986 announcement rather than the more recent March announcement with regard to the acceleration of that withdrawal. Most of the costs are not associated with the rate, but the overall withdrawal.

Senator EXON. Gentlemen, we will have additional questions for the record for you. I would ask that you respond as quickly as possible. We will now stand in recess so we can go vote. We will then return and call the last panel for the day. Thank you very much.

[Recess.]

Senator EXON. The subcommittee will please come to order. We are very pleased to welcome Mr. Michael Owen and Dr. Billy Richardson. Gentlemen, we accept your full statements without objection for the record at this time. We apologize and appreciate your patience in waiting for a hearing. The foregoing part took longer than we had earlier anticipated.

We are all behind on our schedules and I assume that you are likewise. I would ask that each of you please summarize your statements in as short a time as possible. We will have a few questions and we will attempt to move this along as quickly as we can. Welcome to both of you. I have no indication as to which one of you would like to go first, so I will turn it over to you. Dr. Richardson, would you please proceed?

STATEMENT OF BILLY RICHARDSON, ACTING DEPUTY ASSISTANT TO THE SECRETARY OF DEFENSE, ATOMIC ENERGY/CHEMICAL MATTERS

Dr. RICHARDSON. Thank you, Mr. Chairman. I will, as you asked, abbreviate my comments. We are pleased to be here to cover our

program with you. We appreciate your past support of our programs, and, of course, seek your continued support.

I want to say I have with me several back-up witnesses who will answer any detailed questions that come up. Mr. Owen will make a statement. We have with him General Nydam, Program Manager (PM) for demilitarization. We have Mr. Mike Parker, PM binary, and Captain Larry Pfitzenmaier of the Navy, who is our Program Manager for Bigeye.

As you know, the hazard of chemical and even biological warfare has actually worsened in recent years. As you yourself, I think, said in your opening statement, at least 20 countries have a chemical warfare program; at least 10 nations have a biological warfare program.

We believe our initiation of production of a limited binary capability was directly responsible for the Soviet Union becoming more forthright in addressing their stockpile. We still feel a substantial gap exists in what the Soviets are saying they have and what they actually have, and, as you may know, the United Kingdom actually charged the Soviet Union with lying last month in meetings.

Admiral Crowe, Chairman of the JCS, has recently stated, as reported in the press, that Soviet capabilities would place the United States and NATO at a severe disadvantage in a time of war in the area of chemical warfare capability and chemical defense. At present, we need both defensive and retaliatory programs. I think the Department of Defense position on this is indicated by the fact that in a period which you described earlier, as a budget crunch, our total reduction in defensive programs was something under 3 percent for fiscal year 1990.

Like you, like Senator Thurmond and other members of the committee, I hate to see any reduction. But compared to the billions being cut, we have fared pretty well in this program in internal DOD negotiations. I would also note that the Joint Chiefs of Staff stated on March 31 that the CINCs agree the Bigeye is vitally needed and the production of Bigeye is of utmost importance to our deterrence posture.

An item that has been of interest to the Senate has been the development of a long-range stand-off chemical weapons system. I would note that we have a mission needs statement drafted by the Joint Staff and now in circulation to start the process toward development and acquisition of such a system. In summary, until we have an effectively verifiable and comprehensive global ban and elimination of the chemical weapons threat, we need both the mutually supporting areas of defense and deterrence.

Mr. Chairman, I would like to address briefly some of the discussion on shelters that was covered earlier. We will submit a statement for the record on that. The cut in shelters was made, a total of \$14 million in 1990, \$25 million the following year. The program continues. We have 96 of those shelters in place now.

The shelters being cut in that reduction are for rest and relief. It does not tap the area of medical shelters. We plan to continue the program. The program is set up in such a way that if funds became available, we could easily reaccelerate the procurement of such shelter systems.

With that set of comments, sir, I turn the program back to you and to Mr. Owen.

[The prepared statement of Dr. Richardson follows:]

RECORD STATEMENT

OF

DR. BILLY RICHARDSON

ACTING DEPUTY ASSISTANT TO THE SECRETARY OF DEFENSE

(ATOMIC ENERGY) (CHEMICAL MATTERS)

INTRODUCTION

I APPRECIATE THE OPPORTUNITY TO ADDRESS THE SUBCOMMITTEE TODAY AND TO PRESENT THE DEPARTMENT OF DEFENSE PROGRAMS FOR CHEMICAL WARFARE, CHEMICAL AND BIOLOGICAL DEFENSE, AND UNITARY CHEMICAL WEAPONS DEMILITARIZATION.

WE ARE HERE TODAY ASKING FOR YOUR CONTINUING SUPPORT TO HELP PREVENT THE USE OF CHEMICAL AND BIOLOGICAL WEAPONS AGAINST THE ARMED FORCES OF THE UNITED STATES AND ITS ALLIES. BECAUSE OF UNCHECKED PROLIFERATION, WE NOW FACE A GLOBAL CHEMICAL AND BIOLOGICAL WARFARE MENACE. THE PROBLEM HAS BECOME PARTICULARLY ACUTE IN THE MIDDLE EAST.

THE UNITED STATES MUST BE FULLY PREPARED TO DETER ANY PERCEPTION BY POTENTIAL ADVERSARIES THAT THEY COULD GAIN AN ADVANTAGE BY INITIATING CHEMICAL OR BIOLOGICAL WARFARE. SHOULD THAT DETERRENCE FAIL, WE MUST HAVE THE CAPABILITY TO SURVIVE THE ATTACKS, CONTINUE OPERATING EFFECTIVELY AND, MOST IMPORTANTLY, RETALIATE IN A PROPORTIONATE MANNER TO SWIFTLY AND SURELY STOP CHEMICAL WARFARE. THEREFORE, DETERRENCE IS BASED ON TWO EQUALLY NECESSARY PILLARS -- A STRONG DEFENSIVE CAPABILITY AND AN EFFECTIVE CHEMICAL RETALIATORY CAPABILITY. LACKING EITHER OF THESE PILLARS, THE UNITED STATES HAS NO CREDIBLE DETERRENT. AS YOU MAY BE AWARE, THE CHAIRMAN OF THE JCS RECENTLY DETERMINED THAT CHEMICAL WARFARE AND CHEMICAL AND BIOLOGICAL DEFENSE WERE SOME OF HIS MOST SIGNIFICANT MILITARY SHORTFALLS.

THE PROBLEM

OVER THE YEARS, THE CONGRESS AND THE DEPARTMENT OF DEFENSE

HAVE AGREED TO THE FUNDAMENTAL PREMISE THAT

IT IS ABHORRENT, REPREHENSIBLE AND UNACCEPTABLE THAT
CHEMICAL WEAPONS EVER BE USED AGAINST THE MEN AND WOMEN
OF THE ARMED FORCES OF THE UNITED STATES OR ITS ALLIES
AND THAT THE UNITED STATES WILL DO ALL IT CAN TO
PREVENT SUCH USE.

OUR ABILITY TO ACCOMPLISH THIS IS CLEARLY THREATENED BY
EVENTS AROUND THE WORLD.

MORE NATIONS POSSESS CHEMICAL AND BIOLOGICAL WEAPONS TODAY
THAN AT ANY OTHER TIME IN HISTORY. THE MAJORITY OF THESE NATIONS
ACQUIRED THEIR CHEMICAL WEAPONS AFTER THE UNITED STATES BEGAN ITS
MORATORIUM ON CHEMICAL WEAPONS PRODUCTION AND TESTING IN THE LATE
1960S. MOST OF THESE COUNTRIES ARE FOUND IN REGIONS OF STRATEGIC
INTEREST TO US. SOME ARE ACQUIRING LONG RANGE DELIVERY SYSTEMS
SUITABLE FOR CHEMICAL AND BIOLOGICAL WARHEADS. THE 1972
BIOLOGICAL WEAPONS CONVENTION PROHIBITS POSSESSION OF BIOLOGICAL
WEAPONS, BUT WE KNOW OF AT LEAST TEN COUNTRIES WITH BW PROGRAMS.
MOST OF THE TEN ARE SIGNATORIES TO THE CONVENTION. CW AND BW
PROLIFERATION HAS OCCURRED AND CONTINUES.

THE SOVIET UNION CONTINUES TO HAVE THE WORLD'S GREATEST
CAPABILITY FOR CONDUCTING CHEMICAL AND BIOLOGICAL WARFARE. WE
BELIEVE OUR INITIATION OF PRODUCTION OF A LIMITED BINARY CHEMICAL
CAPABILITY WAS DIRECTLY RESPONSIBLE FOR THE SOVIETS BECOMING MORE
FORTHRIGHT IN ADDRESSING THE EXISTENCE AND SIZE OF THEIR CHEMICAL
STOCKPILE. HOWEVER, WE FEEL A SUBSTANTIAL GAP EXISTS BETWEEN THE
DECLARED SIZE OF THE SOVIET STOCKPILE AND ACTUAL SOVIET
CAPABILITIES. WITHIN THE PAST MONTH, THE UNITED KINGDOM HAS
DIRECTLY CHARGED THE USSR WITH LYING ON THIS POINT. WE ARE ALSO
GREATLY CONCERNED ABOUT AGENTS THEY MAY HAVE CHOSEN NOT TO
DECLARE.

EVEN IN THE EVENT WE COME TO A CHEMICAL WEAPONS AGREEMENT,
WE WILL CONTINUE TO FACE SERIOUS GLOBAL THREATS. DISARMAMENT
MUST BE VERIFIABLE AND ALL CW-CAPABLE STATES MUST OPENLY

PARTICIPATE IF WE ARE TO HAVE TRUE SECURITY.

OUR CHEMICAL WARFARE RETALIATORY CAPABILITY IS STILL ONLY MARGINALLY CREDIBLE. AS THE CONGRESS HAS RECOGNIZED, OUR UNITARY WEAPONS STOCKPILE IS NOT A CREDIBLE DETERRENT. WE ARE ACQUIRING THE 155MM BINARY CHEMICAL ARTILLERY ROUND. HOWEVER, WE WILL NOT BEGIN PRODUCTION OF THE BINARY BIGEYE BOMB AND THE MULTIPLE LAUNCH ROCKET SYSTEM BINARY CHEMICAL WARHEAD UNTIL THE EARLY 1990'S. WE HAVE A SERIOUS MILITARY DEFICIENCY IN OUR ABILITY TO RETALIATE AGAINST ENEMY FIRST USE.

WE ARE MAKING GOOD PROGRESS IN OUR DEFENSIVE PROGRAMS, BUT DEFENSE ALONE IS NOT AN EFFECTIVE DETERRENT. THE DEBILITATION THAT COMES WHILE WEARING PROTECTIVE MASKS, GLOVES, OVERBOOTS AND OVERGARMENTS CUTS DEEPLY INTO AN INDIVIDUAL'S ABILITY TO PERFORM AND SUSTAIN HIS OR HER MISSION. SOLDIER PERFORMANCE AND AIR FORCE SORTIE GENERATION RATES DROP DRAMATICALLY IN AS LITTLE AS TWO TO FOUR HOURS. THIS OFTEN MEANS OUR FORCES CANNOT EFFECTIVELY EXECUTE THEIR ASSIGNED MISSIONS WHILE OPERATING IN A CONTAMINATED ENVIRONMENT. THIS IS EQUIVALENT TO LOSING A LARGE PORTION OF OUR COMBAT FORCE WHILE THE ENEMY IS NOT EQUALLY ENCUMBERED BY CB PROTECTIVE GEAR. OUR POTENTIAL ADVERSARIES MUST KNOW THAT BECAUSE OF OUR RESOLVE AND CAPABILITY FOR CHEMICAL RETALIATION THEY WILL LABOR UNDER THE SAME OPERATIONAL ENCUMBRANCES IF THEY USE CW OR BW -- WE CANNOT ALLOW THEM TO HAVE THIS ADVANTAGE.

RECENT EVENTS

SEVERAL EVENTS IN THE PAST YEAR WARRANT THE SUBCOMMITTEE'S ATTENTION.

FIRST, WE ARE CONCERNED OVER SIGNIFICANT POLICY DECLARATIONS BY THIRD WORLD NATIONS AT JANUARY'S PARIS CONFERENCE ON CHEMICAL WEAPONS. SOME OF THESE NATIONS STATED THAT CHEMICAL WEAPONS ARE A LEGITIMATE COUNTERBALANCE TO NUCLEAR WEAPONS AND THAT ANY CONTROL OF CHEMICAL WEAPONS MUST BE LINKED AS WELL TO NUCLEAR

WEAPONS. THIS WILL COMPLICATE OUR NEGOTIATIONS.

SECOND, PRESIDENT BUSH HAS CLEARLY REITERATED OUR LONG HELD POLICY OF PURSUING A COMPREHENSIVE, TRULY GLOBAL AND EFFECTIVELY VERIFIABLE CHEMICAL WEAPONS TREATY NEGOTIATED FROM A POSITION OF STRENGTH. THE DEPARTMENT FULLY SUPPORTS THIS POLICY.

THIRD, AS EVIDENCED BY CONTINUING PROLIFERATION, CONTROL OF THE PRECURSOR COMPOUNDS AND EQUIPMENT NEEDED TO PRODUCE CHEMICAL AND BIOLOGICAL WARFARE AGENTS IS EXTREMELY COMPLICATED. MANY OF THESE PRECURSORS HAVE LEGITIMATE INDUSTRIAL AND BIOMEDICAL APPLICATIONS. WE ARE STILL INVESTIGATING THE IMPACT OF PRECURSOR AND PRODUCTION EQUIPMENT PROLIFERATION AND THE BEST METHODS OF CONTROL.

WE HAVE ALSO RECEIVED CONVINCING EVIDENCE OUR POTENTIAL ADVERSARIES ARE DEVELOPING NEW AGENTS FOR WHICH WE MAY NOT HAVE ADEQUATE DEFENSES. SUCH AGENTS COULD PRESENT A DESTABILIZING MILITARY ADVANTAGE.

ANOTHER SIGNIFICANT CONCERN IS THE CHEMICAL WEAPONS COMPLEX OF COLONEL QADDAFI. IN FACT, OUR INTELLIGENCE INDICATES ITS PRODUCTION CAPACITY COULD ALLOW LIBYA TO PRODUCE A SIGNIFICANTLY LARGE STOCKPILE IN A FAIRLY SHORT PERIOD OF TIME. WE ARE ALSO CONCERNED BY PRESS REPORTS OF LIBYA'S ATTEMPT TO ACQUIRE AN IN-FLIGHT AERIAL REFUELING CAPABILITY TO EXTEND THE RANGE OF THEIR FIGHTER-BOMBER AIRCRAFT. ISRAEL AND OUR OTHER ALLIES IN THE REGION ARE NOW UNDER A VERY REAL CHEMICAL THREAT.

CONCLUSIONS

WHAT DOES ALL OF THIS MEAN TO THE SECURITY OF THE UNITED STATES? FIRST OF ALL, WE CANNOT SLACKEN OUR PACE IN MODERNIZING OUR RELATIVELY MODEST CHEMICAL ARSENAL. MODERNIZATION APPEARS TO HAVE PLAYED A KEY ROLE IN THE FIRST REAL BREAKTHROUGHS AT THE GENEVA CHEMICAL TALKS; CONTINUED MODERNIZATION WILL HELP KEEP THEM GOING. SECOND, WHILE WE STRIVE FOR THE TOTAL ELIMINATION OF CHEMICAL AND BIOLOGICAL WEAPONS, WE MUST ALSO BE PREPARED FOR A WORLD IN WHICH A FEW OF THE CHEMICAL-CAPABLE NATIONS REFUSE TO

SIGN OR COMPLY WITH A CHEMICAL WEAPONS TREATY AND SOME RETAIN A BIOLOGICAL WEAPONS CAPABILITY DESPITE THE BIOLOGICAL WEAPONS CONVENTION. THIRD, WE MUST BE VIGILANT IN ANTICIPATING AND IDENTIFYING NEW THREATS TO OUR FORCES AND THOSE OF OUR ALLIES; WE MUST AVOID SURPRISE. FINALLY, OUR OLD UNITARY STOCKPILE NO LONGER POSES A CREDIBLE DETERRENT TO CHEMICAL WARFARE, AND WE ARE COMMITTED TO ITS COMPLETE DESTRUCTION AS IT IS REPLACED BY SAFE AND MODERN BINARY WEAPONS.

CHEMICAL WARFARE RETALIATORY PROGRAM

AN EFFECTIVE CHEMICAL WEAPONS RETALIATORY CAPABILITY PROVIDES THE FIRST CRITICAL PILLAR FOR CBW DETERRENCE. FOR THAT RETALIATORY CAPABILITY TO PROVIDE CREDIBLE DETERRENCE, IT MUST DENY THE ENEMY ANY ADVANTAGE GAINED BY INITIATING CHEMICAL WARFARE. AN ADVERSARY MUST RECOGNIZE THAT OUR CAPABILITY TO RETALIATE WILL PLACE HIS FORCES IN A POSTURE AT LEAST AS CUMBERSOME AND DEGRADING AS OUR FORCES MUST FACE. THIS ADVANTAGE MUST BE DENIED THROUGHOUT THE ENTIRE BATTLEFIELD, FROM FRONT LINE COMBATANTS THROUGH SECOND ECHELON REINFORCEMENTS TO AIR BASES, LOGISTICS UNITS, AND COMMAND AND CONTROL SITES IN THE REAR AREAS. THIS ADVANTAGE MUST BE DENIED TO POTENTIAL ADVERSARIES IN ALL THEATERS OF CONFLICT. I HAVE ALREADY DESCRIBED THE SIGNIFICANT THREATS TO OUR FORCES AND THOSE OF OUR ALLIES IN THE MIDDLE EAST.

OUR CURRENT UNITARY MUNITIONS DO NOT PROVIDE THAT CREDIBLE DETERRENCE. THAT SMALL PORTION OF THE OLD STOCKS WHICH CAN STILL BE EMPLOYED HAS ONLY LIMITED MILITARY USEFULNESS. OUR PROGRAM TO PRODUCE BINARY CHEMICAL WEAPONS ENHANCES DETERRENCE AND MAKES IT CREDIBLE. OUR TRIAD OF BINARY CW SYSTEMS -- THE 155MM ARTILLERY ROUND, THE BIGEYE BOMB, AND THE BINARY CHEMICAL WARHEAD FOR THE MULTIPLE LAUNCH ROCKET SYSTEM -- WILL PROVIDE A SAFE, EFFECTIVE AND GLOBAL CW RETALIATION CAPABILITY. WE CANNOT RELY ON JUST ONE OR EVEN TWO OF THESE SYSTEMS TO MAINTAIN DETERRENCE; THESE ARE COMPLEMENTARY WEAPON SYSTEMS, AND ALL THREE ARE ESSENTIAL.

THE 155MM ARTILLERY PROJECTILE PROVIDES THE CLOSE-IN, FRONT LINE RETALIATORY CAPABILITY TO OUR GROUND FORCES. ACQUISITION OF THESE MUNITIONS CONTINUES. THE BINARY CHEMICAL WARHEAD FOR THE MLRS ALLOWS THE OPERATIONAL COMMANDER TO INTERDICT SECOND ECHELON AND FOLLOW-ON FORCES AND PROVIDES TIMELY AND FLEXIBLE CW RETALIATION WITH MASSIVE, ACCURATE FIREPOWER. THIS WEAPON HAS MOVED TO FULL SCALE DEVELOPMENT FOLLOWING A SERIES OF SUCCESSFUL DEVELOPMENT TESTS. THE BIGEYE BOMB SUPPORTS RETALIATION AGAINST REAR AREA FORCES WITH A RANGE LIMITED ONLY BY THE AIRCRAFT THAT DELIVER IT. BIGEYE IS THE ONLY CREDIBLE DETERRENT TO ATTACKS AGAINST OUR FORCES IN THE MEDITERRANEAN AND MIDDLE EAST AND OTHER REGIONS WHERE WE MAY NOT BE ABLE TO IMMEDIATELY EMPLOY GROUND FORCES. THE CINCS WITH RESPONSIBILITIES FOR THOSE REGIONS CALL IT THEIR HIGHEST CHEMICAL PRIORITY. THE BIGEYE IS SCHEDULED FOR CONTINUED OPERATIONAL TESTING BEFORE BEGINNING PRODUCTION. IN ADDITION, WE HAVE BEGUN ASSESSING FUTURE BINARY CW SYSTEMS THAT CAN PROVIDE IMPROVED STAND-OFF RANGE, ACCURACY AND FLEXIBILITY. OUR RECENT CLASSIFIED REPORT TO THE ARMED SERVICES COMMITTEES DESCRIBES OUR PLAN FOR INTENSIFYING OUR RESEARCH AND DEVELOPMENT EFFORTS FOR A LONG RANGE STANDOFF CW SYSTEM.

WE REMAIN COMMITTED TO ACHIEVING A TRULY GLOBAL, COMPREHENSIVE AND EFFECTIVELY VERIFIABLE BAN ON CHEMICAL WEAPONS. I AGAIN ASK THAT YOU RECOGNIZE THE CONTINUING IMPORTANCE CHEMICAL WEAPONS PLAY IN OUR WORLD AND THE ABSOLUTE NECESSITY OF AN EFFECTIVE CW RETALIATORY CAPABILITY.

CHEMICAL AND BIOLOGICAL DEFENSE PROGRAM

CHEMICAL AND BIOLOGICAL DEFENSE FORM THE SECOND PILLAR OF DETERRENCE. AS IN THE PAST, SHOULD DETERRENCE FAIL, WE NEED TO PROTECT AND EFFECTIVELY SUSTAIN OUR FORCES IN THE EVENT THEY ARE ATTACKED WITH CHEMICAL OR BIOLOGICAL AGENTS. AS ALWAYS, WE WILL INVESTIGATE JOINT AND COOPERATIVE PROCUREMENT PROGRAMS FOR DEFENSIVE EQUIPMENT AS A WAY OF CONTROLLING OUR COSTS. WE WILL

ALSO CONTINUE TO INVEST IN FUTURE TECHNOLOGY.

WE SHOULD NOT CONSIDER REDUCING OUR CHEMICAL DEFENSE BUDGET BECAUSE "A CHEMICAL WEAPONS TREATY IS ON THE HORIZON." WE MUST EMPHASIZE THAT OUR FORCES ARE SUBJECT TO WORLDWIDE DEPLOYMENT, AND WE SEE REASON FOR CONCERN THAT EVERY CW-CAPABLE NATION IN THIS WORLD WILL SIGN AND COMPLY WITH A CHEMICAL WEAPONS TREATY. IN ADDITION, THE CURRENT VERSION OF THE TREATY ROLLING TEXT CALLS FOR A TEN-YEAR IMPLEMENTATION PERIOD DURING WHICH OUR FORCES WOULD REMAIN VULNERABLE TO CHEMICAL ATTACK.

OUR FY 1990 CHEMICAL AND BIOLOGICAL DEFENSE BUDGET REQUEST IS ABOUT \$700 MILLION, AND FOR FY 1991 WE REQUEST \$811 MILLION. THIS EQUATES TO APPROXIMATELY 60 PERCENT OF OUR CHEMICAL WARFARE AND CHEMICAL AND BIOLOGICAL DEFENSE BUDGET REQUEST.

OVER THE LAST SEVERAL YEARS WE HAVE MADE MANY IMPROVEMENTS IN OUR ABILITY TO SURVIVE A CB ATTACK AND CONTINUE OPERATIONS. HOWEVER, WE STILL HAVE A LONG WAY TO GO TO REALIZE OUR GOAL OF SUSTAINING EFFECTIVE OPERATIONS FOR LONG PERIODS WITH LITTLE DEGRADATION. EXISTENCE OF A TREATY AND THE ELIMINATION OF OUR CHEMICAL RETALIATORY DETERRENT WILL INCREASE, NOT DECREASE, THE NEED TO DEFEND OUR FORCES FROM THE THREAT OF CBW ATTACK FROM NON-SIGNATORIES AND CHEATERS.

RESEARCH AND DEVELOPMENT

IN RESEARCH AND DEVELOPMENT, WE WILL CONTINUE WORK ON VERY MUCH NEEDED NEXT GENERATION DEFENSIVE SYSTEMS. OUR FY 1990 RDT&E REQUEST TOTALS OVER \$307 MILLION AND \$322 MILLION IN FY 1991. TO PROVIDE OUR FORCES WITH EFFECTIVE PROTECTION, WE ARE DESIGNING SYSTEMS TO DETECT, DEFEND AND PROTECT AGAINST THE GROWING NUMBERS OF CHEMICAL AND BIOLOGICAL INFECTIOUS AND TOXIN AGENTS. OUR CURRENT R&D PROGRAMS WILL ALLOW US TO BEGIN FIELDING IN THE EARLY TO MID-1990S NEW DETECTORS AND ALARMS, DECONTAMINATION SYSTEMS, AND MATERIEL (LIKE THE SOLDIER INTEGRATED PROTECTIVE ENSEMBLE AND COLLECTIVE PROTECTION FOR THE HEAVY FORCE MODERNIZATION). WE

WILL ALSO COMPLETE DEVELOPMENT OF AND FIELD NEW PRETREATMENT DRUGS FOR IMPROVED PROTECTION, A SKIN DECONTAMINATION KIT, AN IMPROVED ANTIDOTE FOR NERVE AGENTS AND ENHANCED MEDICAL TREATMENT CAPABILITIES.

BOTH THE ARMY AND THE AIR FORCE WILL CONTINUE PROGRAMS TO PROVIDE MUCH NEEDED BODY COOLING SYSTEMS FOR OUR PERSONNEL WHO MUST WEAR CHEMICAL OVERGARMENTS IN HIGH TEMPERATURE - HIGH WORKLOAD SITUATIONS. OTHER AIR FORCE INITIATIVES WILL FOCUS ON COMPLETING TESTING AND FIELDING OF THE AIRCREW EYE/RESPIRATORY PROTECTION SYSTEM FOR THE AIR FORCE AND THE NAVY AND THE FIXED-SITE DETECTION AND WARNING SYSTEM.

TO PROTECT OUR FORCES AGAINST ENEMY USE OF BIOLOGICAL WEAPONS, WE WILL FIELD THROUGH THE MID-1990S DECONTAMINANTS, A NEW TOXIN ANTIDOTE, A BROAD SPECTRUM ANTIVIRAL DRUG FOR TREATMENT OF HEMORRHAGIC FEVERS AND NEW VACCINES FOR PROTECTION AGAINST INFECTIOUS BIOLOGICAL AGENTS. WE DESTROYED ALL OF OUR BIOLOGICAL WEAPONS LONG AGO. WE PERFORM NO RESEARCH, DEVELOPMENT, TESTING, PRODUCTION OR STOCKPILING OF BIOLOGICAL WEAPONS. OUR BIOLOGICAL DEFENSE EFFORTS ARE CONDUCTED IN FULL COMPLIANCE WITH THE BIOLOGICAL WEAPONS CONVENTION AND WITH THE CENTERS FOR DISEASE CONTROL - NATIONAL INSTITUTES OF HEALTH (CDC-NIH) GUIDELINES, "BIOSAFETY IN MICROBIOLOGICAL AND BIOMEDICAL LABORATORIES." OUR TOTAL RDT&E BUDGET REQUEST INCLUDES OVER \$64 MILLION IN FY 1990 AND OVER \$67 MILLION IN FY 1991 FOR THE MEDICAL ASPECTS OF BIOLOGICAL DEFENSE.

PROCUREMENT

THE THRUST OF THE DEFENSIVE PROCUREMENT PROGRAM IS TO INCREASE OUR STOCKS OF READINESS-RELATED EQUIPMENT (LIKE MASKS, CHEMICAL AGENT ALARMS, VACCINES AND ANTIDOTES) WHILE IMPROVING THE ABILITY OF OUR FORCES TO SUSTAIN EFFECTIVE OPERATIONS IN A CONTAMINATED ENVIRONMENT. EVERY SOLDIER, SAILOR, AIRMAN AND MARINE IN OR DEPLOYABLE TO A CHEMICAL THREAT AREA HAS THE

INDIVIDUAL EQUIPMENT NEEDED TO SURVIVE THE INITIAL CHEMICAL ATTACKS, BUT THIS EQUIPMENT MUST BE UPDATED.

IN 1990 AND 1991, THE ARMY WILL CONTINUE THEIR PROCUREMENT OF 1,300 SIMPLIFIED COLLECTIVE PROTECTION EQUIPMENT SETS AND BEGIN FIELDING COLLECTIVE PROTECTION FOR THE HEAVY FORCE MODERNIZATION IN THE MID-1990S. THEY WILL MAKE LARGE SCALE PURCHASES OF THE CHEMICAL AGENT MONITOR, OR CAM, IN FY 1990 CONTINUING INTO FY 1991. THE CAM WILL BRING A MUCH-NEEDED PORTABLE NERVE AND BLISTER AGENT SURVEY DEVICE TO THE FIELD. THE NBC RECONNAISSANCE SYSTEM PROGRAM CONTINUES WITH A COMPETITIVE SHOOT-OFF SCHEDULED THIS YEAR TO SELECT THE SYSTEM WE WILL BUY. THIS WILL PROVIDE OUR FORCES WITH THEIR FIRST NEAR REAL-TIME CAPABILITY TO DETECT, IDENTIFY AND REPORT CONTAMINATION ON THE BATTLEFIELD. IT WILL ALLOW OUR GROUND FORCES TO REALLY EMPLOY THE CONCEPT OF CONTAMINATION AVOIDANCE -- OUR FUNDAMENTAL NBC DEFENSE DOCTRINE. THE ARMY HAS REQUESTED FUNDS TO BUY 14 VEHICLES IN FY 1990 AND 28 IN FY 1991. FOR MEDICAL PROTECTION, THE ARMY AND THE OTHER SERVICES WILL FIELD PRETREATMENT DRUGS FOR IMPROVED PROTECTION, AN IMPROVED ANTIDOTE FOR NERVE AGENTS AND AN ENHANCED MEDICAL TREATMENT CAPABILITY IN THE EARLY TO MID-1990S.

THE NAVY CB DEFENSE PROCUREMENT PROGRAM CONTINUES THEIR ACROSS-THE-BOARD IMPROVEMENTS IN READINESS AND SUSTAINABILITY. THEY HAVE BECOME THE FIRST SERVICE TO FIELD A STANDOFF CHEMICAL AGENT DETECTION SYSTEM, THE AN/KAS-1 CHEMICAL WARFARE DIRECTIONAL DETECTOR. WHILE IT IS A RUDIMENTARY SYSTEM, IT DOES PROVIDE OUR NAVAL FORCES WITH THE CAPABILITY TO MANEUVER AROUND OR OUT OF CHEMICAL CLOUDS. ALONG WITH THE ARMY, THE NAVY WILL PURCHASE A SIZABLE NUMBER OF CAMS. THEY ALSO PLAN TO PURCHASE APPROXIMATELY 100 CHEMICAL AGENT POINT DETECTION SYSTEMS EACH YEAR FOR INSTALLATION ABOARD SURFACE SHIPS. THEIR COLLECTIVE PROTECTION PROGRAM CONTINUES TO FOCUS ON PROVIDING THIS IMPORTANT CAPABILITY FOR THEIR FLEET. FOR THEIR SHORE INSTALLATIONS THEY WILL PROCURE A VARIANT OF THE AIR FORCE'S SURVIVABLE COLLECTIVE PROTECTION

SYSTEM. ALSO IN CONJUNCTION WITH THE AIR FORCE, THE NAVY IS FIELDING THE MCU-2/P PROTECTIVE MASK.

THE AIR FORCE PROGRAM GOAL IS TO PROTECT INDIVIDUALLY AND COLLECTIVELY ALL OF THEIR PERSONNEL IN OR DEPLOYABLE TO CB THREAT AREAS -- SOME 400,000 AIRMEN IN ALL. TO DATE, THEY HAVE FIELDIED 75,000 NEW GROUND CREW MASKS WITH OVER 100,000 MORE ON CONTRACT FOR DELIVERY THIS YEAR. THE FIRST DELIVERIES OF IMPROVED AIRCREW MASKS WILL BEGIN IN 1990 WITH F-16 AND C-130 UNITS RECEIVING THE FIRST BATCHES. THEY PLAN ON BUYING 40,000 NEW AIRCREW MASKS BY THE TURN OF THE CENTURY. THE AIR FORCE HAS ALSO BEGUN FIELDING THE SECOND GENERATION GROUND CREW OVERGARMENT AND WILL BEGIN FIELDING ITS SECOND GENERATION AIRCREW OVERGARMENT IN 1991. ALONG WITH THE ARMY AND NAVY, THE AIR FORCE WILL ALSO ACQUIRE THE CAM.

AS IN THE PAST, THE AIR FORCE WILL CONTINUE PROCUREMENT OF COLLECTIVE PROTECTION -- FILTERED FACILITIES WHERE PEOPLE CAN WORK AND REST WITHOUT MASKS AND OVERGARMENTS. WITHOUT IT, AIR FORCE BASES CANNOT SUSTAIN OPERATIONS IN A CHEMICAL ENVIRONMENT. MORE THAN 60 WORK CENTERS HAVE RECEIVED COLLECTIVE PROTECTION SYSTEMS WITH ANOTHER 60 PROGRAMMED TO RECEIVE THEM OVER THE NEXT 10 TO 15 YEARS. THEY HAVE INSTALLED 97 SURVIVABLE COLLECTIVE PROTECTION SYSTEMS AND WILL CONTINUE PROCUREMENT THROUGHOUT THE REMAINDER OF THE FYDP. THE AIR FORCE WILL ALSO BUY THE SIMPLIFIED COLLECTIVE PROTECTION SYSTEM ROOM LINER ALONG WITH THE ARMY.

IN SUMMARY, OUR CHEMICAL AND BIOLOGICAL DEFENSE PROGRAMS WILL CONTINUE TO GENERATE IMPROVEMENTS IN THE READINESS OF OUR FORCES TO SURVIVE AND FIGHT FOR EXTENDED PERIODS IN CONTAMINATED REGIONS. TO EFFECTIVELY DETER CHEMICAL ATTACK, WE MUST ALSO HAVE THE CAPABILITY AND THE DETERMINATION TO EFFECTIVELY RETALIATE WITH CHEMICAL WEAPONS ACROSS THE LENGTH AND BREADTH OF THE BATTLEFIELD.

UNITARY CHEMICAL STOCKPILE DEMILITARIZATION PROGRAM

THE THIRD MAJOR PART OF OUR CHEMICAL BUDGET IS THE CHEMICAL DESTRUCTION OR DEMILITARIZATION PROGRAM. FUNDED UNDER THE CHEMICAL AGENTS AND MUNITIONS DESTRUCTION, DEFENSE (CAMD,D) AND ARMY MILITARY CONSTRUCTION ACCOUNTS, IT WILL TOTAL APPROXIMATELY \$311.4 MILLION IN FY 1990 AND \$414.6 MILLION IN FY 1991. WE EXPECT TO SPEND AN ADDITIONAL \$1.8 BILLION BEGINNING IN FY 1992 AND CONTINUING THROUGH PROGRAM COMPLETION IN FY 1997.

I WOULD LIKE TO ADDRESS ONE ISSUE OF INTEREST TO THE SUBCOMMITTEE -- THE DEPARTMENT'S DECISION TO CANCEL CRYOFRACTURE AS AN ALTERNATE TECHNOLOGY. THE CRYOFRACTURE PROCESS WOULD FREEZE THE MUNITIONS TO NEAR ABSOLUTE ZERO, FRACTURE THEM IN A PRESS INTO SMALL PIECES AND THEN INCINERATE THE PIECES. OUR BASELINE SYSTEM WILL DISASSEMBLE THE MUNITIONS ALLOWING US TO SEPARATE THE METAL COMPONENTS, THE EXPLOSIVE CHARGES AND THE CHEMICAL AGENT PRIOR TO INCINERATION.

THE DEPARTMENT DID NOT MAKE THIS DECISION HASTILY OR RASHLY. AFTER REVIEWING ALL OF THE EVIDENCE AND ALL OF THE PROGRAMMATIC DATA, WE COULD COME TO NO OTHER DECISION. THIS IS NOT TO SAY CRYOFRACTURE HAS NO POTENTIAL MERIT. HOWEVER, WE WERE FORCED TO CONFRONT SCHEDULE PROBLEMS AND THE BEST USE OF OUR LIMITED RESOURCES.

THE CRYOFRACTURE DEVELOPMENT PROGRAM IS NEARLY FIVE YEARS BEHIND THE BASELINE DISASSEMBLY PROGRAM. IF WE RESTORED ALL OF THE FUNDS TO THE CRYOFRACTURE PROGRAM AND ASSUMED NO DELAYS DUE TO PROBLEMS WITH ENVIRONMENTAL IMPACT, TESTING, EQUIPMENT PRODUCTION AND SAFETY, THAT SINGLE PLANT AT ONE OF THE NINE DESTRUCTION SITES WOULD ONLY HAVE A FEW MONTHS OF WORK REMAINING BEFORE ALL OF THE CHEMICAL MUNITIONS THERE WERE DESTROYED.

CRYOFRACTURE TECHNOLOGY ALSO HAS IMPORTANT LIMITATIONS. IT IS NOT APPLICABLE TO THE DESTRUCTION OF SPRAY TANKS, BOMBS AND THE ONE-TON CONTAINERS OF BULK STORED AGENT. THESE ITEMS MAKE UP ABOUT 65 PERCENT OF THE STOCKPILE TONNAGE WE MUST DESTROY. WE

ARE ALSO CONCERNED ABOUT THE SAFETY AND EFFICACY OF USING A SINGLE, MASSIVE ROTARY KILN TO SIMULTANEOUSLY INCINERATE AGENT, METAL PARTS AND EXPLOSIVES. MUCH MORE TESTING WOULD HAVE TO BE DONE IN THIS FIRST-TIME EVER EXPERIMENT WITH THIS KILN.

FINALLY, LIKE ALL OTHER AREAS OF GOVERNMENT, WE ARE CONCERNED ABOUT USE OF THE TAXPAYER'S DOLLARS. WE CANNOT WITH GOOD CONSCIENCE JUSTIFY SPENDING OVER \$200 MILLION ON A PROGRAM THAT PROVIDES ONLY MARGINAL BENEFIT TO THE CHEMICAL DEMILITARIZATION PROGRAM. WE FULLY REALIZE DEMILITARIZATION IS A JOB WE MUST DO.

WE HAVE THE FULLEST CONFIDENCE IN THE BASELINE DISASSEMBLY TECHNOLOGY PROGRAM. AS OF TODAY, NO ONE HAS DEMONSTRATED THAT CRYOFRACTURE IS ANY SAFER, BETTER OR MORE COST EFFECTIVE THAN THE BASELINE SYSTEM.

AFTER REVIEWING THE EVIDENCE, I THINK THAT THE MEMBERS OF THIS COMMITTEE AND THE AMERICAN PUBLIC WILL AGREE WITH OUR DECISION.

COMPARED TO THE BUDGET SUBMITTED IN JANUARY OF THIS YEAR, THIS NEW CHEMICAL DEMILITARIZATION BUDGET INCLUDES ADDITIONAL FUNDS FOR ACCELERATING THE RETROGRADE -- OR RETURN -- OF OUR UNITARY CHEMICAL WEAPONS FROM THE FEDERAL REPUBLIC OF GERMANY. AS YOU KNOW, WE HAVE BEEN STUDYING THE FEASIBILITY OF REMOVING THOSE WEAPONS EARLIER THAN THE PREVIOUSLY AGREED TARGET DATE. THE DEPARTMENT IS COMPLETING CONCEPT PLANS FOR CONSIDERATION BY THE NATIONAL SECURITY COUNCIL. WE ASK FOR \$24.9 MILLION MORE IN FY 1990 AND AN ADDITIONAL \$4 MILLION IN FY 1991.

SUMMARY

TODAY I HAVE PRESENTED TO YOU THE DEPARTMENT OF DEFENSE PROGRAM FOR CHEMICAL WARFARE AND CHEMICAL AND BIOLOGICAL DEFENSE. WE HAVE A VERY REAL AND GROWING THREAT THROUGHOUT THE WORLD BECAUSE OF THE WARSAW PACT'S CONSIDERABLE CAPABILITIES AND THE PROLIFERATION OF CHEMICAL AND BIOLOGICAL WEAPONS AND THE LINKAGE, BY SOME NATIONS, OF CHEMICAL ARMS CONTROL TO NUCLEAR ARMS

CONTROL.

WE COMPLETELY SUPPORT THE ADMINISTRATION'S EFFORTS TO NEGOTIATE A TRULY GLOBAL AND EFFECTIVELY VERIFIABLE CHEMICAL WEAPONS BAN. HOWEVER, EVEN IF WE SHOULD ACHIEVE A CHEMICAL TREATY, WE WILL ALWAYS NEED A DEFENSIVE PROGRAM. UNTIL SUCH A BAN IS IN FORCE, WE MUST ALSO MAINTAIN A CREDIBLE CHEMICAL RETALIATORY CAPABILITY TO DETER CBW ATTACKS ON OUR FORCES AND THOSE OF OUR ALLIES.

GENERAL JOHN J. PERSHING STATED IN A 1919 REPORT TO THE CONGRESS THAT,

WHETHER OR NOT GAS WILL BE EMPLOYED IN FUTURE WARS IS A MATTER OF CONJECTURE, BUT THE EFFECT IS SO DEADLY TO THE UNPREPARED THAT WE CANNOT AFFORD TO NEGLECT THE QUESTION.

THAT STATEMENT IS AS TRUE TODAY AS IT WAS 70 YEARS AGO.

IN MY OPENING REMARKS, I SAID THE DEPARTMENT NEEDED YOUR HELP. WE HAVE GREATLY APPRECIATED YOUR SUPPORT IN THE PAST, AND I HOPE WE HAVE CONVINCED YOU TO EXTEND IT AGAIN.

Senator EXON. Thank you, Dr. Richardson. Mr. Owen.

STATEMENT OF MICHAEL W. OWEN, PRINCIPAL DEPUTY ASSISTANT SECRETARY OF THE ARMY, INSTALLATION AND LOGISTICS

Mr. OWEN. Thank you, Senator. I will very briefly give you a thumbnail sketch of the Chemical Demilitarization Program. The Army serves as the executive agent for the Defense Department in actually executing the program to destroy our aging unitary lethal stockpile of chemical munitions.

Since we last visited with this subcommittee a little over a year ago, a number of important things have happened in the program. Just a little over a year ago, we made a very major decision in this program when we announced that we had decided to destroy the chemical stockpile at the eight CONUS locations where they are currently stored, versus moving the munitions to one national disposal site at Tooele, Utah, or two regional sites, one in Utah and one someplace in the east.

We will be destroying all chemical agents at the eight depots where they are currently located in Oregon, Utah, Colorado, Arkansas, Kentucky, Alabama, Maryland and Indiana. I believe that is all eight sites. It was a major decision for this program. During the last year we have successfully operated a chemical demilitarization plant at Pine Bluff Arsenal, AR. It is somewhat different

than the other eight plants that we propose to build in that it is destroying the chemical agent BZ, which is non-lethal. But there are some similarities, and I would like to report that the program has gone very well, very successful, and we are well beyond 50 percent completion. We have destroyed one entire type of munition and are over 50 percent complete in destroying the other type of munition that is there.

We will actually finish destroying BZ munitions at Pine Bluff, AR, I believe, late this fall, and then it will take us a while to clean that plant and destroy the ash and trash associated with that operation. We did that without any major incidents; we are very proud of that.

Also, during this past year, we have actively gotten under way the Chemical Demilitarization Program's emergency response program, a large program that, throughout the course of the program, we anticipate will cost approximately \$100 million. We are working very closely with the Department of Health and Human Services (HHS) and, the Federal Emergency Management Agency (FEMA). During this past year, we have started to move funds to FEMA to allow them to engage in their role in this program.

We have organized what we call ICCBs in the eight local communities. The impacted local communities and state officials are planning with us, the Army, HHS, and FEMA, to be able to better respond to any emergencies that may occur while these munitions are still in storage in the United States or during chemical demilitarization operations in the plants.

The program will undertake to make certain that the local communities, some of our communities being rural, very rural and remote, have the appropriate state-of-the-art emergency response equipment, masks, whatever it may be, communications systems, that will allow all of us to respond to any emergency that may occur.

Also, during the last year, we made a tremendous amount of progress on Johnston Island, where we are building the first full-size destruction plant for the program. We are in the middle of systematizing the plant and proving out the equipment. That has gone slower than originally anticipated. We communicated with this committee not too long ago; it was mentioned earlier this afternoon.

Dr. Costello sent a letter over here that indicated we had slipped approximately 7 months in our ability to bring the Johnston Island, or JACADS, plant on-line for operational verification testing. We continue to feel as though March 1990 is a goal that we are working for now to be able to bring that plant up and actually start destroying live chemical agent munitions out on Johnston Island.

Very shortly, in a matter of weeks, we will actually start turning dirt and commencing construction on the first CONUS demilitarization plant and the largest CONUS demilitarization plant, the plant at Tooele, UT, outside of Salt Lake City. That is where approximately 42 percent of this Nation's stockpile is stored. It is the largest plant; it will operate the longest. It is truly a pacing item in the entire program and we are pressing ahead to begin construction there.

We, also very shortly, will begin construction of a central training facility at Edgewood Arsenal. MD, where we will train all of the operators of these plants. They will be taken there and taught the computer systems, the emissions control systems, et cetera.

That is currently where we are in the program, sir. I stand ready to answer any questions you may have.

[The prepared statement of Mr. Owen follows:]

STATEMENT BY
MR. MICHAEL W. OWEN

PRINCIPAL DEPUTY ASSISTANT SECRETARY OF THE ARMY
(INSTALLATIONS AND LOGISTICS)

I am Mike Owen, Principal Deputy Assistant Secretary of the Army for Installations and Logistics. I appreciate the opportunity to appear before your Committee and discuss with you the current status of the Chemical Demilitarization Program.

When we came before you at this time last year, the Army had just completed the Final Programmatic Environmental Impact Statement (FPEIS) for the program and made the decision to disassemble and incinerate the old lethal unitary chemical weapons at the eight storage installation in the United States. We also provided an Implementation Plan which laid out the schedule and costs for the entire program. At that time, we expressed to you our confidence in the program and the Army's ability to safely and efficiently dispose of the unitary chemical stockpile by 1997.

Last May, we began destroying the incapacitating agent BZ at Pine Bluff Arsenal, Arkansas. I am pleased to inform you that disposal operations have progressed smoothly and to date we have destroyed the entire bulk inventory of BZ and half of the BZ munitions. We will complete destruction of the remaining BZ stocks by the end of this year. The BZ program is going well.

Right now we are evaluating bids and plan to make an award shortly for the construction and operation of the Central Demilitarization Training Facility to be built at Aberdeen Proving Ground, Maryland. This facility will be in operation during the entire life of the disposal program and will provide initial and refresher training for disposal plant personnel. A strong training program is critical to ensuring safe operations.

I am also pleased to report to you the establishment of a national board to facilitate the exchange of information between Federal, State and local agencies involved with the Chemical Demilitarization Program. We have also established local boards at each of the eight disposal sites in the continental United States. We call these groups Inter-governmental Consultation and Coordination Boards or ICCB's. The first meeting of the national ICCB was held last October. Local boards are meeting now. We formed these boards now so that they could participate in the environmental review process. We intend to continue this important interface throughout the life of the program. Based on our

interaction to date, we expect local input in two key areas--the site-specific review process and the program to upgrade emergency preparedness and response.

First, let me discuss our site-specific review process. Some Members of Congress were concerned that we did not consider enough site-specific information when we made our decision to destroy the chemical munitions on site at each of the storage installations. To alleviate these concerns, the Army agreed to conduct additional studies at each site and take a fresh look at the on-site decision. Once this is done, we will then be in a position to either validate or reject the environmentally preferred alternative--on-site incineration.

We have completed the review of the Chemical Demilitarization Program planned at Tooele Army Depot, Utah. We found some interesting things. First, the latest population data showed some significant changes in the number and location of the people living around the disposal site. Second, we discovered we had misread coordinates in siting the plant, indicating it would have been 10 kilometers further south than it should have been. These two factors together caused an increase in the number of people that fall within the precautionary zone (the 100 kilometer radius around the storage area). These are significant findings. However, since the Tooele facility was part of all three alternatives (national, regional, and local disposal options), the change in population data affected each alternative equally. Therefore, these findings did not change our on-site disposal decision.

Based upon these studies and analyses, I am confident that on-site incineration is the best alternative for destroying the chemical stocks at Tooele Army Depot. We recently certified this fact to the Congress. Similar reviews are now under way at Anniston Army Depot, Alabama; Pine Bluff Arsenal, Arkansas; Lexington-Blue Grass Army Depot, Kentucky; and Umatilla Depot Activity, Oregon. Reviews at the remaining three sites: Pueblo Depot Activity, Colorado; Newport Army Ammunition Plant, Indiana; and Aberdeen Proving Ground, Maryland will be completed by October 1990.

Next, let me discuss emergency response. The program to upgrade the emergency response systems at each of the eight storage locations and in the communities surrounding the installations is now well under way. In August, the Army and the Federal Emergency Management Agency (FEMA) entered into an agreement which outlines the responsibilities of each Agency in the areas of emergency preparedness and emergency response. A Steering Committee was formed to make policy decisions. In addition, the ICCB's referred to earlier also offer an additional forum for discussing emergency response issues.

We are also developing tougher standards and criteria which will be used to measure the adequacy of the existing emergency response programs. The funds--\$11.8 million--that have been appropriated so far will be used to purchase equipment, improve training, and upgrade plans at each site

to meet the new standards. The State and local communities are key players in this program. Working in cooperation with FEMA, the Army has provided each of the storage states with \$100,000 to hire additional personnel at the State and local level to support this important program. Their input and practical knowledge are essential to ensure we implement the best emergency response system available to support both the chemical storage and demilitarization missions. We plan to have the upgraded emergency response system in place by December 1992 and spend about \$100 million to complete the total job of upgrading both on and off-post emergency response capabilities.

All eyes are now focused on the Johnston Atoll Chemical Agent Disposal System--commonly called JACADS. This is our first full-scale facility and the place where we will verify the technology, equipment and operating procedures that will be used at the plants in the continental United States. JACADS is based on our most tested and proven technology of disassembling munition components and incinerating them in separate furnaces.

We have accomplished much at Johnston Island during the past year. The remaining process equipment has been installed. The equipment to destroy M55 rockets and bulk containers has been tested and accepted and should be fully proved out using simulants this year. Cadre training (the training of trainers) is complete and the remaining personnel are currently being trained. In short, we are making final preparations to pass a rigorous preoperational safety inspection before we start the 16-month Operational Verification Test or OVT.

Right now, we are several months behind schedule. Frankly, we underestimated the time that it would take to recruit and train skilled workers to work at the isolated island in the South Pacific. We also experienced some nagging problems in isolating and debugging our computer-controlled software and equipment. These problems were compounded by accelerated corrosion of some of the support equipment from ocean salt spray. However, most of our troubles are behind us now. We have revised our JACADS schedule and have what we consider to be a realistic plan. We hope to begin OVT at JACADS in March 1990--7 months later than originally planned. The bottom line is we are making good progress at Johnston Island, and we remain confident that JACADS can do what is required.

The purpose of the OVT period is to demonstrate how the baseline technology (disassembly and incineration) that we demonstrated at the Chemical Agent Munitions Disposal System works in a full-scale chemical disposal system. To do this, we plan to run four separate tests, each lasting two to four months. We will begin by testing M55 rockets containing the nerve agent GB and follow that with one-ton containers containing mustard, M55 rockets containing the nerve agent VX and then mustard filled projectiles. These live-agent tests will be used to validate the process, operating procedures, environmental and safety aspects of the JACADS. Lessons learned will be applied to the plants in the continental United States.

The bottom line, of course, for all disposal operations is safety. I have asked the National Academy of Sciences' National Research Council (NRC), in their Congressionally-mandated, independent oversight role, to review our operational verification test plan and provide a technical assessment of the test procedures and results. We also will have an independent organization collect, evaluate and package the test data. This effort and the work to be done by the NRC will be funded using a portion of the \$5.0 million appropriated in fiscal year 1989 for safety-related issues. Only when I am confident that we have satisfied the stringent set of criteria established for this test will the Army be able to certify to you that the JACADS facility is ready to begin full-scale disposal operations. I will notify you immediately if any additional problems cause a delay in the OVT schedule and any impact that might have on the construction of the facilities to be built in the United States.

We are in the process of evaluating bids for the construction, equipment installation, operations, and closure of the first chemical disposal facility in the United States. This facility, which will be built at Tooele Army Depot, Utah, will be used to destroy 42% of the chemical stockpile. Construction of the Tooele facility is scheduled to begin this July. The lessons learned from the JACADS OVT will be factored into the operating procedures and training at the Tooele plant and equipment will be retrofitted, if necessary. Construction of the remaining disposal facilities is planned for December 1991 at Anniston Army Depot, Alabama; Pine Bluff Arsenal, Arkansas; and Umatilla Depot Activity, Oregon; and June 1992 at Aberdeen Proving Ground, Maryland; Lexington Blue-Grass Army Depot, Kentucky; Newport Army Ammunition Plant, Indiana; and Pueblo Depot Activity, Colorado. As previously mentioned, lessons learned at JACADS will be incorporated into the design and operation of these plants prior to any contract award.

Last year the Congress asked the Army to construct and verify a full-scale cryofracture plant to augment or backup the baseline technology being used at JACADS. For the past few years, we have aggressively pursued the development and testing of the cryofracture process. After comparing costs, schedules and progress at JACADS with the cryofracture program, the Department of Defense reached the conclusion that it was time to focus our resources and efforts on the baseline technology in order to meet the Congressional mandate of destroying our chemical stockpile by 1997. This decision was also based on the conclusion that the disassembly technology is safe, effective and ready to go. Cryofracture is not as mature and therefore requires more developmental and verification testing before it can be used as a production or destruction facility.

I have made plans for the NRC to continue in their oversight role of the Chemical Demilitarization Program. During the past year, members of the NRC Committee on Chemical Disposal visited the JACADS and the Chemical Agent Munitions Disposal System at Tooele Army Depot. We recently received two reports from the NRC--one on munitions handling and the other on cryofracture. The NRC feels that continuing to pursue the cryofracture technology is "counterpro-

ductive to the development and operation of a safe and efficient chemical stockpile program." Their assessment is based on uncertainties in the cryofracture process and still to be proven aspects of the technology. I have copies of their reports for you today. The NRC has also expressed concerns in the areas of training, monitoring, and command and control. We have taken action to implement several recommendations in these areas. In my opinion, based on informal discussions with the Committee, I can say with confidence that the Army is doing an excellent job in preparing for chemical disposal and the baseline technology we are using is sound.

We are still looking at the entire area of command and control of chemical disposal facilities in order to formulate the most efficient and safest structure for the operation of the disposal plants. I am sure you can appreciate that this is an extremely difficult and complex issue. We will report to you our decisions in this area.

Recently, a decision was made to make every effort to accelerate the retrograde of the unitary chemical munitions stored in Germany. In order to move out and implement this decision and be sure of being able to meet the new schedule, we redirected \$11.7 million of the fiscal year 1989 funds appropriated for the Chemical Demilitarization Program to the retrograde effort. We have initiated a Congressional reprogramming to reimburse the Chemical Demilitarization Program and provide an additional \$3.0 million of operation and maintenance funds for this effort. These funds will be used to procure chemical agent monitors and transport containers, upgrade the ports in Germany, modify MILVANS (land and sea containers), and provide administrative support for the European retrograde.

Next year at this time, we will report to you on our OVT at JACADS, the progress we have made in constructing the Central Demilitarization Training Facility and the full-scale disposal facility at Tooele Army Depot, and the results of our site-specific environmental reviews at Anniston Army Depot, Umatilla Depot Activity, Pine Bluff Arsenal and Lexington-Blue Grass Army Depot. In the meantime, I will keep you informed of any major changes in the program. We appreciate the strong interest and support of the members of this Committee in helping us accomplish the challenging job of disposing of the United States stockpile of unitary chemical agents and munitions.

Mr. Chairman, thank you for the opportunity to make this written statement for the record. Brigadier General Nydam, Program Manager for Chemical Demilitarization, and I will do our best to answer your questions.

CONCERN OVER CHEMICAL DETERRENT REMOVAL

Senator EXON. Thank you very much. Let me start with you, Dr. Richardson. I appreciate your direct answers in anticipation of what you might be asked with regard to the cuts that have been made. You did a good job in defending the Department of Defense's basic strategy.

I recognize, as we all do, the serious problem with the budget that I previously said we have to wrestle with up here all the time. I guess so, it seems to me, that when we are pulling out the deterrent for whatever reason, and probably good ones that have been advanced here today.

There is a lot of concern—and should be a lot of concern—because we are having a pull-out, a significant reduction, in our chemical deterrent force in Europe that are going to return to the United States and would have to be flown back, if we get into a war-fighting situation, to protect our troops there.

If we were pulling our troops out at the same time we were pulling out the chemical deterrent, then it would make sense. But to leave our troops there and reduce the chemical shelters does not make any sense to me, and I do not believe that that is very sound thinking. Could you elaborate further? Do you agree with my concern?

Dr. RICHARDSON. I certainly agree. I have a strong interest in supporting the chemical defense effort and agree with and support your interest in that area. I would say that the two things were done as unrelated actions.

The shelter exercise was part of a general drill to try to cope with the budget crunch, but it does leave us with, as I say, 96 shelters in place in central Europe and more on the way. It will defer for 1 year some of the shelters in the U.K. and in Germany, but not medical shelters. It was done in such a way that contracts remain ongoing. We can, as I say, reaccelerate those efforts.

We do spend a total of \$700 million on defense; it is a large program. Of course, of our total budget in this area that we are looking at this afternoon, all but 9 percent goes to defense and demilitarization. So we are very cognizant of what you are saying. We share your concerns about defense being very essential, and have tried to, I believe, adjust to budget realities in the safest and most practical way possible.

BIGEYE

Senator EXON. Well, thank you. We expressed that concern enough today and it remains a question in my mind, but let us move on to something else. Dr. Richardson, I believe there was a Chemical and Engineering News report published in May that said an outside panel of experts advising the GAO on Bigeye supported past GAO findings that serious developmental and operational issues remain unresolved on the Bigeye matter. How do you respond to this? Can you bring us up to date?

Dr. RICHARDSON. I would like to leave the bulk of the answer to that question to Captain Pfitzenmaier, who can give you the details better than I. I would say, however, in prefacing his remarks that in my recent assumption of duties here in the Pentagon, I have had

an opportunity to look at Bigeye in a different way than I have in the past years.

I believe that as development programs go, it has really gone quite well. In recent trials, it had one unsatisfactory out of 14 areas. That is far better than is often the case with other weapons. My own, somewhat outside, assessment from my newness is that Bigeye is a good system, we need it.

We have a strong Joint Chiefs of Staffs' sense of urgency in getting the system, but, actually, I think it has been going rather well. Let me ask, however, Captain Pfitzenmaier to respond to your questions.

Senator EXON. Captain, we want to welcome you. I would appreciate your making a presentation on this very critical matter. I agree and there are many of us that have supported the Bigeye and in some of those 50-50/51-49 votes that have occurred on the floor of the U.S. Senate. It seems to me, I do not know when we started talking about the Bigeye, but it was years and years, not months and months ago.

And if it is ever going to work, it is about time for it to work. Can you give us your assessment of the situation? I would simply point out that the GAO findings in this area just make it more and more difficult to sustain this program.

Why is it that we have seemingly taken an inordinate amount of time to produce this weapon, which may be highly technical, although I have never been able to quite understand, with all the things that we do in other areas, why we are having such a terrible time with this one. Can you help us?

Captain PFITZENMAIER. Mr. Chairman, I will try. First, it is good to be back to see you again and I look forward to answering these questions. I would like to pick up where Dr. Richardson left off.

As you recall, last year, in our discussion in this room, you mentioned how important it was that we had the Bigeye operational evaluation report available to review. The case that we presented to you last year was based on our understanding of that report, but, regrettably, we did not have the report in hand.

Now we do, and that operational report showed that out of 14 areas, only one was graded unsatisfactory. That was an area of reliability which is, as I discussed earlier, not safety; it is simply the mechanical reliability of the weapon. We are taking all prudent steps to improve that to bring it up to its specification requirement.

The facility we are going to use to manufacture the Bigeye bomb is now complete. That was completed last month at Van Nuys, CA. At this moment they are qualifying and doing the final testing on the machinery in that building.

We will begin construction of our Bigeye bombs for our next series of testing in September of this year. That will be our first article acceptance testing, and then in January we will take delivery of weapons which will be used in our next series of tests. Those tests will be complete in September. We are anticipating a success, I assure you, which would allow us to enter into a contract in early 1991 for the first delivery of Bigeye bombs in 1992.

I would like to back up for a moment and address your initial question regarding the recent GAO view. We simply disagree with

the GAO's assessment that our earlier developmental testing was flawed, or ineffective, or insufficient.

We have as our primary technical adviser on the Bigeye bomb, the engineers, and the scientists, and the chemists at the Army, at Edgewood and Aberdeen. They have been in this business for 100 years. In our view, they are the best in the business. We also have the expertise of the Naval Weapons Center at China Lake, CA.

We simply feel that when you take that into account and the number of committees and official and professional OSD forums which we have received approval on prior to entering operational testing, that our developmental testing is, in fact, sound. We have discussed this, of course, with GAO and have failed to reach mutual agreement on that.

Senator EXON. Captain, how long has the U.S. Government been involved directly in the production and testing of the Bigeye bomb, in years?

Captain PFITZENMAIER. Mr. Chairman, the initial concept of a bomb like Bigeye goes back to the early 1960s. However, it was not until 1983 that the current design, which, of course, has the mixing of the two binary components after the weapon leaves the aircraft—it was not until 1983 that that concept was initiated, and that has taken us to the point where we are now.

Senator EXON. In your opinion, is that slow or is that fast, or is that about average for what we would anticipate? We anticipated that this system would be operational much before now, did we not?

Captain PFITZENMAIER. We did, sir. I believe it has taken longer—it has certainly taken longer than we would like it to.

In 1986 we approved approval at the DOD level to enter into low-rate initial production; and again, I believe that our test results have substantiated our competence in this.

Senator EXON. Thank you very much, Captain. I have no further questions of this panel.

I simply wish to advise you that there will be other questions by other Senators that will be directed to you, and I would appreciate you responding to those as promptly as you can for the record.

Senator Thurmond.

Senator THURMOND. Thank you, Mr. Chairman.

JOHNSTON ISLAND STARTUP

Mr. Owen, in your prepared testimony, you stated that the Johnston Island startup would be delayed by approximately 7 months. Will this delay affect the overall objective of completing the demilitarization program by 1997?

Mr. OWEN. Yes, Senator, there has been a delay on Johnston Island of approximately 7 months before we can begin what we call operational verification testing, which actually results in the destruction of chemical munitions.

However, at this time we do not anticipate that the delay on Johnston Island will result in a delay at the back end of the demilitarization program, which is to say 1997. We still feel as though we

can accomplish the entire program, destroying the entire stockpile, by April 1997.

CHEMICAL WEAPONS

Senator THURMOND. Dr. Richardson, the American proposal in Geneva would ban all chemical weapons. What is a chemical weapon, given today's new strains of agents? And has there been a debate among the negotiators over the definition of a chemical weapon?

Dr. RICHARDSON. Senator Thurmond, I can give you only generalities on what has been debated among the negotiators, because that is not an area of business I work. We could perhaps get the policy officer in the State Department to respond for the record in that area. On what constitutes a chemical agent—

Senator THURMOND. Do you want to supply anything for the record? Would that be all right? You can answer this whole question for the record. I think it is right important. If you want to answer it now—do you want to answer it now or supply it for the record?

Dr. RICHARDSON. We will supply an answer for the record.

[The information follows:]

The following definition of chemical weapons is taken from the draft Convention which the U.S. tabled in 1984 (CD/500):

"'Chemical weapons' means,

"(a) super-toxic lethal, other lethal, and other harmful chemicals and their precursors, except for those chemicals intended solely for permitted purposes as long as the types and quantities involved are consistent with such purposes and except for those chemicals which are not super-toxic lethal, or other lethal chemicals and which are used by a Party for domestic law-enforcement and riot control purposes or used as a herbicide; or

"(b) munitions or devices specifically designed to cause death or other harm through the toxic properties of any chemical which is defined as a chemical weapon under subparagraph (a) of this paragraph and which would be released as a result of the employment of such munitions and devices; or

"(c) any equipment or chemical specifically designed for use directly in connection with the employment of such munitions or devices."

The debate in Geneva concerning this definition has focused on two issues. First, some countries disagree with the exclusion of riot control agents and herbicides from the definition of chemical weapons. Second, some countries want to include the "components" of binary or multicomponent chemical weapon systems. Since a "component" is not necessarily a toxic chemical in and of itself, this could create definitional problems for other parts of the Convention which address permitted activities.

Senator THURMOND. Dr. Richardson, in your prepared testimony you stated that, "We have also received convincing evidence that our potential adversaries are developing new agents for which we do not have adequate defenses."

Which countries have developed these agents, and do we have any antidotes and protective measures for these new agents?

Dr. RICHARDSON. Senator Thurmond, I believe that too is a question best answered for the record, with classified information.

Senator THURMOND. That will be all right, if you would answer for the record.

[The information follows:]

[Deleted.]

Senator THURMOND. Dr. Richardson, if new, unknown agents are being developed by other countries, can we build equipment to monitor the production of these agents for treaty verification, if we do not fully understand their composition?

Dr. RICHARDSON. It is possible to build such detectors, and we have been addressing that in a battlefield sense and are beginning to look at it in an on-site verification sense. Two approaches are sometimes referred to as generic detectors or a mass spectrometry technique, and a biosensor, biologically based sensor, which is more properly called a receptor site-based sensor. So, it is theoretically possible, Senator Thurmond. For battlefield approaches, we have such detectors planned with a fielding date of late in the 1990s.

Senator THURMOND. I want to thank you gentlemen for your presence and your testimony.

Thank you, Mr. Chairman.

Senator EXON. Thank you, Senator Thurmond.

Gentlemen, thank you very much.

We are adjourned.

[Questions for the record with answers supplied follow:]

QUESTION SUBMITTED BY SENATOR SAM NUNN

MASK DRINKING SYSTEM—PROGRAM STATUS

Senator NUNN. Dr. Richardson, What is the status of the Army's program to develop and procure a canteen which allows soldiers to drink water more quickly and efficiently without removing their chemical masks?

Dr. RICHARDSON. The current Army program to enable soldiers to drink water easier while in Mission Oriented Protective Posture (MOPP) III/IV, centers around the transportation or delivery of the contents of the canteens and not the canteen itself. To that effect, the Army has embarked on a non-developmental item (NDI) effort, as prescribed by Congressional funding language. The Mask Drinking System (MDS) candidate, Fluid Intake Suction Tube (FIST) Hydration System, Weslyn Co, has been procured and subjected to physiological (heat stress) and limited human factors testing. The results of physiological testing have shown that soldiers are able to drink water more consistently when using the FIST Hydration System and the 2 quart collapsible canteen only, when following current drinking procedures. Results from limited human factors testing have shown that the FIST Hydration System, by nature of its design, is not compatible with rigid-walled canteens, specifically the standard issue, 1 quart canteen. Furthermore, the Army has been informed by the manufacturer of the FIST Hydration System that the design submitted will not meet the Army's chemical agent resistance requirement; however, future designs could be fabricated from compliant materials. The Army has considered a solution to these problems by adopting a "modified" FIST Hydration System for use with the 2 quart collapsible canteen, as an interim item, and commencing an R&D effort (full solution) to design a drinking system capable of interfacing with all canteens currently issued or under development. The programs and their associated costs are:

		Fiscal year—				
		1990	1991	1992	1993	1994
a. Interim NDI MDS:						
	R&D	\$405K	\$180K			
	OMA (Procure)		500M			
b. Full Solution MDS:						
	R&D	255K	400K	\$345K	\$75K	
	OMA (Procure)				10M	\$10M

BIGEYE—PANEL RESULTS

Senator NUNN. Dr. Richardson, *Chemical and Engineering News* reported on May 1 that an outside panel of experts advising the GAO on BIGEYE has supported past GAO findings that serious developmental and operational issues remain unresolved. How do you respond?

Dr. RICHARDSON. The developmental issues that were reviewed by the independent panel are issues that have no bearing on the present design and envisioned use of the weapon. The decision to go to the off-station mix concept was a direct result of having areas which could have presented problems with the old on-station mix configuration. This decision has resulted in a weapon that is safer to handle for our troops and that has shown during two phases of operational testing that it will be an operationally effective and suitable weapon.

The only operational issue that remains unresolved is the mechanical reliability of the weapon. The present demonstrated reliability of the BIGEYE weapon compares favorably to the reliability of other weapons at the same stage in the acquisition cycle. I believe that the actions currently underway to improve the mechanical reliability will be successful, and further improvement in reliability will be seen in the next series of operational tests.

QUESTIONS SUBMITTED BY SENATOR ALAN J. DIXON

MASK DRINKING SYSTEM—OTHER SOLUTIONS

Senator DIXON. Dr. Richardson, does the Army have any other ready solution to the gas mask drinking system for chemical environments?

Dr. RICHARDSON. No. The Army is currently pursuing only the development of the Mask Drinking System, which will interface with existing chemical protective equipment and procedures.

MASK DRINKING SYSTEM—WESLYN SYSTEM

Senator DIXON. Dr. Richardson, would the Army allow material corrections to the Weslyn system being tested to satisfy deficiencies found to date by the Army?

Dr. RICHARDSON. Yes. The revised program development plan proposed by the Army includes submitting the FIST Hydration System to further indepth chemical testing after modification to impart adequate chemical agent resistance. If successfully type classified, the FIST Hydration System will be issued as an interim item for use in tropic and desert environments, where the 2 quart collapsible canteen is fielded.

Senator DIXON. Dr. Richardson, can these changes be incorporated in the system for testing to be conducted in August for chemical environment tests?

Dr. RICHARDSON. No. The testing of parts of the current system, originally scheduled for August is now scheduled for September. The testing of the revised system is scheduled for early fiscal year 1990, dependent upon the funding discussed previously.

Senator DIXON. Dr. Richardson, will the Weslyn system work with the 2 quart canteen if material corrections are made?

Dr. RICHARDSON. Yes.

Senator DIXON. Dr. Richardson, would the Army accept a flexible 1-quart canteen if the Weslyn drinking system will work as indicated? Why not, if the Army purchases significant quantities per year?

Dr. RICHARDSON. No. There are several reasons that the Army does not plan to develop a flexible 1-quart canteen for use with the FIST Hydration System:

a. The Mask Drinking System requirement document includes an essential characteristic that the system be compatible with all canteens in the Army inventory. This includes the cold weather canteen, which is metal, rigid-walled and must remain so in order that frozen contents in the canteen can be melted on an open flame or arctic stove.

b. A flexible 1-quart canteen would not offer the durability and protection against chemical (and other hazards) provided by the present 1-quart plastic canteen. These limitations are recognized in the 2-quart flexible canteen but are offset by the available capacity—essential in tropic and desert environments.

[Whereupon, at 4:32 p.m., the hearing was adjourned.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEARS 1990 AND 1991

MONDAY, JUNE 12, 1989

U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC FORCES
AND NUCLEAR DETERRENCE,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

ANTI-SATELLITE AND SPACE CONTROL PROGRAMS

The subcommittee met in executive session at 2:12 p.m. in room SR-222, Russell Senate Office Building, Senator J. James Exon (chairman of the subcommittee) presiding.

Committee members present: Senators Exon, Levin, Bingaman, Glenn, Thurmond, Gorton, and Coats.

Committee staff member present: Arnold L. Punaro, staff director.

Professional staff members present: Robert G. Bell, William E. Hoehn, Jr., T. Kirk McConnell, and Michael J. McCord.

Minority staff members present: Brian D. Dailey, and George W. Lauffer, professional staff members.

Staff assistant present: Mickie Jan Wise.

Committee members' assistants present: Jeffrey B. Subko, assistant to Senator Exon; Kenneth N. Luongo, assistant to Senator Levin; William J. Lynn, assistant to Senator Kennedy; Edward M. McGaffigan, Jr., assistant to Senator Bingaman; Milton D. Beach and Donald A. Mitchell, assistants to Senator Glenn; Leon S. Fuerth, assistant to Senator Gore; Terrence M. Lynch, assistant to Senator Shelby; James M. Bodner, assistant to Senator Cohen; Dudley L. Carlson, assistant to Senator Wilson; Anthony H. Cordesman, assistant to Senator McCain; Robert M. Soofer, assistant to Senator Gorton; and Charles G. Percy, assistant to Senator Lott.

OPENING STATEMENT OF SENATOR J. JAMES EXON, CHAIRMAN

Senator Exon. The subcommittee will please come to order.

The subcommittee meets today to receive testimony on DOD's anti-satellite and other so-called "space control" programs as part of the committee's continuing review of fiscal years 1990 and 1991 Defense budget.

Several weeks ago, the subcommittee received testimony from General Piotrowski, who presented a disturbing space net assess-

ment and articulated his views on requirements in the area of space control. The Under Secretary of Defense for Policy, Dr. Paul Wolfowitz, is here today to provide us with a policy perspective on these issues.

We also intend to review programmatic aspects of the administration's ASAT budget request, and we have a distinguished panel of service acquisition representatives for that purpose.

Space control, gentlemen, can mean denying, as you well know, any adversary the ability to operate in space or deterring an adversary from trying to prevent our use of space or ensuring that we can perform essential missions in space in spite of adversary efforts to deny us these missions.

If neither side possessed anti-satellite capabilities, for example, both sides could operate freely. It is also possible that we could still be able to conduct essential missions in space even if an adversary alone possessed a minimal anti-satellite capability if our assets were highly survivable and heavily redundant, or if we could successfully reconstitute.

Thus, space control is a complex concept, rather than a simple matter of which side or the other has an ASAT weapon. As a matter of policy, we in the Congress need to understand what level or type of space control we should seek and are in fact seeking, and whether or not our various space programs are consistent with that policy.

For instance, General Piotrowski's testimony is that the Soviets can jam or destroy many of our critical space systems and we cannot replace them, while the Soviets can rapidly replace whatever they might lose to a future U.S. ASAT weapon. Moreover, our space systems are better than theirs in terms of performance and in the contribution that they make to our defense capability.

Given that the Soviets appear to be able to win an ASAT war, a U.S. ASAT weapon alone appears to be an inadequate deterrent and an inadequate means of assuring use of space. And I want to emphasize that because I am very fearful that far too often as this problem is addressed, that somehow if we would just deploy an ASAT weapon system then we would not have anything to worry about. You know that is not the case, but it is not said often enough.

DOD also argues that we need an ASAT to prevent the Soviets from targeting our surface fleet and supply ships. My question is, if we attack Soviet ocean reconnaissance and targeting satellites, are we prepared to lose our own critical space systems when they retaliate? If so, who has the greater military advantage?

A reasonable conclusion—reasonable, not necessarily correct—would be that until we improve our satellite survivability and replenishment capability, a negotiated ban on ASATs might be in our military interest. Evidently, the administration disagrees.

But I have read certain things recently that indicate to me that there is some support for at least considering that concept or that possibility. I think we need to see a reasoned argument to justify what seems to be the position of DOD.

At the same time, while we seem willing to spend large sums on ASAT weapons that do not appear to meet our usual standards for effective deterrence, we seem to be less than committed to spend-

ing the money required to fix the satellite survivability and launch responsiveness problems that General Piotrowski finds so troubling.

I also might add that is troubling to the committee. Fixing those problems—slowly but surely—seems to me to be a critical element of our space control concept.

To complicate matters further, our Space Commander in Chief has put forward a proposal for several new space systems, all of which are very expensive. With very tight budgets, I ask, how can we afford to fix our current problems, field an expensive ASAT, and buy new space capability?

Fundamentally this is how I see the question: One, what sort of ASAT capability do we intend to buy? Two, should an arms control approach be ruled out? Three, how and when are we going to enhance the contribution that satellite survivability and launch responsiveness can make to space control? And four, how do these priorities rank against expensive new starts?

Turning to the ASAT program itself, the committee needs to understand how much money is requested for all the various pieces of the ASAT program, how the overall program is going to be managed, and when we will face major milestone decisions.

In addition to the Under Secretary of Defense for Policy, we have with us today representatives from the acquisition community of each of the military services with a piece of the ASAT program. From the Army, which for the time being at least is the lead service for the kinetic kill system, is Lt. Gen. Donald S. Pihl, who is a Military Deputy to the Assistant Secretary of the Army for Acquisition.

From the Air Force, which has responsibility for battle management and C³, is Maj. Gen. Thomas Moorman, Director of Space and SDI Programs in the Office of the Assistant Secretary of the Air Force for Acquisition. From the Navy, we have Rear Adm. David Frost. I believe that Admiral Frost will not be here and I am advised that Admiral Miller will take his place. So welcome to you, Admiral.

Vice Admiral Miller is the Deputy Chief of Naval Operations for Naval Warfare.

Welcome, gentlemen. We are glad that you are here with us today, because we have a lot of questions that we think need answering as we move jointly ahead in this area.

Before I proceed to Dr. Wolfowitz, I would like to ask my great colleague and co-worker, Senator Thurmond, if he has any opening statement.

Senator THURMOND. Thank you, Mr. Chairman.

I also want to extend a warm welcome to the witnesses and thank them for appearing before the subcommittee. Mr. Wolfowitz—or is it “Dr. Wolfowitz”?

Ambassador WOLFOWITZ. “Mister” is fine, sir.

Senator THURMOND. I wanted to welcome you in particular to this subcommittee. This is your first appearance before this Subcommittee on Strategic Forces and Nuclear Deterrence as Under Secretary of Defense for Policy, I believe.

Again, I congratulate you on your confirmation and look forward to working with you during your tenure as Under Secretary. I am

sure the country will be well served by your talents and experience. And I wish all of you the best.

The anti-satellite, or ASAT, program that the witnesses are here to testify on today is of great importance and interest to me and I believe this subcommittee. Approximately 3 weeks ago, General Piotrowski, Commander in Chief of the Space Command, testified before this committee on Soviet space control capabilities. His presentation was most impressive, but also most disturbing. In net terms, the Soviet Union appears to possess the world's most robust and comprehensive space control capability.

As we all know, ASAT weapons are a critical component of any space control capability. General Piotrowski's testimony highlighted the Soviets' persistence to expand their already existing ASAT capability to areas of technology based on other physical principles.

In contrast, the United States, in trying to pursue an ASAT capability, has been prevented from doing so by congressional restrictions and calls for an arms control agreement to ban their deployment on the ground and in space. This has been most unfortunate and I believe wrong.

Even if a treaty banning ASATs could be monitored and verified, which I do not think is possible, I am opposed to such a limitation for basic military reasons. Irrespective of whether the Soviets have or do not have an ASAT weapon, it is imperative that the United States field such a capability to threaten Soviet satellites.

Present and future Soviet ability to track our fleet, ground troops, and air-based forces poses a direct threat to their survivability and effectiveness under any type of potential conflict, nuclear or conventional. Deterrence and stability are weakened by a lack of capability to threaten Soviet satellites.

It is my hope that we can get on with the business of developing and deploying an ASAT system, unencumbered by congressional restrictions or calls for ASAT arms control agreement.

Our future is in space, and we should use our technological superiority to ensure the deployment of an effective offensive and defensive space control capability. Space control is a vital part of our military strategy, and our ability to guarantee American access to space in peacetime and in war.

Thank you, Mr. Chairman.

Senator EXON. Thank you very much, Senator Thurmond.

And now we will proceed with you, Mr. Secretary, in any fashion that you see fit. Do you have a fully prepared statement for the record?

STATEMENT OF HON. PAUL D. WOLFOWITZ, UNDER SECRETARY OF DEFENSE FOR POLICY, ACCOMPANIED BY REAR ADM. DAVID FROST, U.S. NAVY, COMMANDER, NAVAL SPACE COMMAND, OFFICE OF THE CHIEF OF NAVAL OPERATIONS; BRIG. GEN. MORGAN JELLETT, U.S. ARMY, PROGRAM MANAGER, KINETIC ENERGY ASAT PROGRAM, STRATEGIC DEFENSE COMMAND, U.S. ARMY; AND KENT G. STANSBERRY, DIRECTOR OF STRATEGIC DEFENSE AND SPACE ARMS CONTROL POLICY, OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE FOR INTERNATIONAL SECURITY POLICY

Ambassador WOLFOWITZ. I have a prepared statement which I believe was distributed to the committee earlier, yes, Senator.

Senator EXON. We will accept that as a full part of the record, and we will ask that you summarize and then proceed in any fashion which you see fit.

Ambassador WOLFOWITZ. Thank you, Senator.

Senators, we appreciate very much the opportunity to appear before the subcommittee to talk about this important subject, and appreciate very much the level of interest that the subcommittee has shown in what is, I think, increasingly recognized as one of the most important areas of deficiency in our present military posture.

You have already identified, Senator, the witnesses who are here with me at the table: on my right, Vice Adm. Paul Miller, Deputy Chief of Naval Operations for Naval Warfare; immediately on my left, Lt. Gen. Don Pihl, Military Deputy to the Assistant Secretary of the Army for RD&A; and on my far left, Maj. Gen. Tom Moorman, who is the Director of Space and SDI Programs in the Air Force.

We have also, in the interest of being able to answer your questions on whatever level of detail you want, brought with us some real experts, who are just in the row behind me. And let me introduce them at this time, too, if I might:

Rear Adm. David Frost, who is the Commander of the Naval Space Command; Brig. Gen. Morgan Jellett, who is the program manager for the Kinetic Energy ASAT Program in the U.S. Army Strategic Defense Command; and immediately behind me, Mr. Kent Stansberry, who is the Director of Strategic Defense and Space Arms Control Policy in the Office of the Secretary of Defense.

Mr. Chairman, with your permission, I would just like to briefly summarize my written statement, read portions of it, and then my colleagues here will have a few brief oral comments to make, and then we will proceed to your questions, if that is agreeable.

Mr. Chairman, distinguished members of the subcommittee: In view of the continuing need to project power, to deter war and control escalation during conflict, it is essential for the United States to develop and deploy operational anti-satellite systems to deter the Soviets from exploiting their present space control and space-based targeting capabilities.

Excuse me, Mr. Chairman. Before I proceed further, perhaps I should just make sure that our understanding is correct that this session is a classified session at the Top Secret level.

Senator EXON. It is classified at the Top Secret level, and I am glad you mentioned that. I should ask staff to advise the Chair of whether or not the room is properly cleared at that level.

[Pause.]

I am advised that it is and you may proceed.

Ambassador WOLFOWITZ. Thank you, sir.

The United States has long had a requirement to negate the use of threatening Soviet anti-satellite and space-based targeting capabilities. President Reagan in July 1982 called for a prudent, measured response to the Soviet military space threat in order to protect U.S. and allied security interests.

An important element of that prudent and measured response was the development of a U.S. ASAT capability with operational deployment as a goal. The continuing need for a demonstrated U.S. ASAT was reaffirmed in the Presidential Directive on National Space Policy in January 1988, which directed the Department of Defense as part of the mission of space control, to develop and deploy a robust and comprehensive ASAT capability, with programs as required, and with an initial operational capability at the earliest possible date.

Why is there a requirement for a U.S. ASAT? The answers lie in the nature of the Soviet space threat and the nature of our own force posture. The Soviet Union has a massive and expanding military space program. In the Soviet view, military superiority in outer space is achieved first by the use of anti-satellite systems to degrade or destroy the space-based command, control, communications, and intelligence systems of an enemy; and second, by the successful use of space to support military operations, including the use of satellites to target an opponent's forces.

We must not allow the Soviets to view space as a sanctuary from which they can threaten not only valuable U.S. and allied space assets, but also the ground, sea, and air forces so critical to our ability to deter both conventional and nuclear conflicts.

I might emphasize, Mr. Chairman, that the purpose of this entire program is deterrence. At times perhaps it sounds, because of the way one has to discuss the options and the capabilities, as though we are talking about fighting wars in space.

But that is not the purpose. The purpose is to deter war on Earth.

To achieve their objectives in space, the Soviets possess the capability to attack key U.S. satellites at low altitudes and possibly to interfere with key U.S. satellites at all altitudes. This capability includes a non-nuclear co-orbital ASAT weapon and the inherently ASAT-capable GALOSH anti-ballistic missile interceptors that are deployed as part of the Moscow ABM system.

It also includes ground-based test lasers at Sary Shagan and the technological capability for electronic warfare.

The Soviets' operational co-orbital ASAT system has demonstrated against dedicated targets a single shot probability of kill of [deleted]. For comparison purposes, the U.S. Miniature Vehicle anti-satellite system, our development ASAT system based on the F-15 that was canceled, was being designed to have a single shot probability of kill of [deleted].

This capability for the U.S. system was never verified because the program was canceled after only one test against an object in space. That one test was successful. Based, in other words, on the Soviets' [deleted] tests, one can compute and I think one would say as a minimum a [deleted] single shot probability of kill for that existing program.

The Soviets, it is true, have not carried out an integrated test of their operational system since June 1982. However, except for the actual kill mechanism, all component parts, [deleted], have been employed routinely since 1982 as part of the Soviet space program and in exercises.

The booster, the SL-11, that is used to launch the co-orbital ASAT interceptor is also used to launch the RORSAT and the EORSAT, and I believe there have been [deleted].

One particularly telling detail that indicates the Soviets maintain their ASAT in a constant state of readiness is that the [deleted].

Mr. Chairman, a failure to provide response in kind to potential Soviet ASAT use would perpetuate this situation, in which the Soviet Union may attack U.S. and allied space systems, believing that their space systems are not vulnerable to counterattack by a corresponding U.S. capability.

Military exercises have repeatedly demonstrated that, if the Soviets attack and destroy one of our satellites, the United States has two choices, both of which are bad: to do nothing or to take some other military action that could be dangerously escalatory.

In addition to their various ASAT capabilities, and of even greater concern, the Soviets also maintain space-based reconnaissance satellites, whose primary purpose is to locate and direct attacks against U.S. and allied terrestrial forces.

These systems include ocean reconnaissance satellites that use radar and electronic signal monitoring to provide [deleted] over the horizon targeting data to Soviet naval weapons platforms that can quickly attack U.S. and allied surface fleets.

[Deleted.] Valuable targeting information would be used [deleted] to attack our naval forces and to hamper our efforts to reinforce our forces, such as those in Europe, during a crisis.

The United States is by and large a maritime nation. We depend on the use of the sea. But our naval forces and our troop transports could all be easily targeted by Soviet RORSATs and EORSATs.

[Deleted.]

In short, without an operational ASAT there is a critical gap in our overall ability to deter war. We must be able to hold at risk Soviet space assets that are important to their ability to wage war, both conventional and nuclear.

In this way, a sustainable and operational ASAT could be a very important factor in influencing a Soviet decision about whether to go to war. Because of the continuing need for an operational capability, the President's budget for fiscal years 1990 and 1991 contains robust funding to support various ASAT-related development efforts.

Our overall ASAT program relies on upgrades to the supporting space surveillance network, along with a mix of surface-based kinetic energy and directed energy weapons. As to the management

of the program, the Air Force is the lead service for a single comprehensive space surveillance and battle management and command and control system that would control all ASAT capabilities and weapons systems. The Air Force has responsibility for coordinating and integrating those weapons systems elements.

The Army is the interim lead service, and I guess I should underline that word "interim," pending detailed specification of the system. The Army is the interim lead service for the kinetic energy weapons system and is establishing a joint program office to develop, test, and produce a kinetic energy ASAT interceptor.

The Army provides the program manager and the Navy provides the deputy.

At Milestone One, which is now planned for late this year, the Department will review the lead service responsibility, as well as the options for sea-basing and land-basing of kinetic energy ASAT weapons.

For directed energy weapons, no joint program office has been created. The Army and the Air Force are independently investigating various directed energy technologies to prepare alternative concepts for an ASAT directed energy system selection in fiscal year 1991.

Mr. Chairman, probably no single technology will provide a single solution to the threat we face from Soviet space ASAT systems. We need to have an ASAT capability that is agile and responsive enough to meet the full range of requirements of U.S. force commanders in time of crisis and conflict and that is clear and evident to our adversaries so that they are deterred from ASAT use themselves.

Such a capability would be a vital part of our force posture, contributing substantially to our capability to deter not only nuclear war but conventional war and to protect our forces, should conflict occur.

Mr. Chairman, if I might just conclude by observing that I worked in the Defense Department up until 8 years ago. In the briefings that I have gotten upon coming back to DOD, it has struck me that it is this area in which we have developed perhaps the most critical deficiencies in our posture. I think that the attention that the subcommittee is giving therefore to this subject is very well deserved, and we welcome it very much.

And if I might just make two brief comments about your opening remarks, to explain that here in our testimony today we are concentrating specifically on the ASAT program itself. You have rightly pointed out that there is a broader issue of arms control and that issue is currently under review in the administration.

I would be glad to attempt to discuss it in the course of questions, but I would at least like to observe at the outset that I think whatever degree of faith or skepticism you have about ASAT arms control—and I imagine those of us at the witness table lean toward the skeptical side—I think that we would all agree that, whatever regime we want to get to, we are not going to get there if the Soviets have the capabilities and we do not.

And second, you correctly emphasized that there is a much broader spectrum here that includes particularly how we make our own space systems more survivable, and that is absolutely a correct

question. But again, it is not tolerable to have a situation where the Soviets can believe that their systems are survivable and ours are not.

With those opening comments, Mr. Chairman, and with your permission, I would ask briefly first General Pihl, then Admiral Miller, then General Moorman to make a few brief oral comments.

[The prepared statement of Ambassador Wolfowitz follows:]

PREPARED STATEMENT OF PAUL WOLFOWITZ, UNDER SECRETARY OF DEFENSE FOR
POLICY, OFFICE OF THE SECRETARY OF DEFENSE

Mr. Chairman, distinguished members of the subcommittee.

In view of the continued need to project power, to deter war and control escalation during conflict, the Department of Defense feels that it is essential for the United States to develop and deploy an operational anti-satellite system to deter the Soviets from exploiting their present space control and space-based targeting capabilities.

The United States has long had a requirement to negate the use of threatening Soviet ASAT and space-based targeting capabilities against our terrestrial forces and space systems. In July, 1982, then President Reagan called for a prudent, measured response to the Soviet military space threat in order to protect U.S. and Allied security interests. An important element of that prudent and measured response was the development of a U.S. ASAT capability, with operational deployment as a goal.

The continuing need for a demonstrated U.S. ASAT was reaffirmed in the January, 1988, Presidential Directive on National Space Policy, which as part of the mission of space control, directed the Department of Defense to develop and deploy a robust and comprehensive ASAT capability with programs as required and with an initial operational capability at the earliest possible date.

Recognizing this continuing need for a U.S. ASAT capability, President Bush's budget request contains a sizeable, multi-pronged program that will provide an initial U.S. ASAT operational capability in the mid-1990s. Our near-term ASAT program is the result of several major studies within the DOD, with inputs from OSD, the Military Departments, operational commanders, and the Joint Chiefs of Staff.

Why is there a requirement for a U.S. ASAT? The answers lie in the nature of the Soviet space threat and the nature of the U.S. force posture.

The Soviet Union has a massive and expanding military space program. In the Soviet view, military superiority in outer space is achieved: first, by the use of ASAT systems to degrade or destroy the space-based command, control and communications and intelligence systems of an enemy; and second, by the successful use of space to support military operations including the use of satellites to target an opponent's forces. We must not allow the Soviets to view space as a sanctuary from which they can threaten not only valuable U.S. and allied space assets, but also the ground, sea and air forces so critical to our ability to deter both conventional and nuclear conflicts.

To achieve their objectives in space, the Soviets possess the capability to attack key U.S. satellites at low altitude and possibly to interfere with key U.S. satellites at all altitudes. This capability includes their non-nuclear co-orbital ASAT weapon, and the inherently ASAT-capable GALOSH anti-ballistic missile interceptors deployed as part of the Moscow system, ground-based test lasers at Sary Shagan and a technological capability for ASAT electronic warfare.

The operational co-orbital ASAT system has demonstrated against dedicated targets a single-shot probability of kill of [deleted] for comparison, the U.S. miniature vehicle ASAT system (the developmental ASAT system which was canceled) was being designed to have a single-shot probability of kill of [deleted]. This capability for the U.S. system was never verified because the program was canceled after only one test against an object in space; that one test was successful.

The Soviets have not carried out an integrated test of their operational system since June, 1982. However, except for the kill vehicle, all component parts of the system have been employed routinely since 1982 in other parts of the Soviet space program and in exercises. For example, the SL-11 booster that is used to launch the co-orbital ASAT interceptor is also used to launch RORSAT and EORSAT. [Deleted.] Another telling indication that the Soviets maintain their ASAT in a constant state of readiness is that the ASAT [deleted].

Failure to provide a response in-kind to potential Soviet ASAT use would perpetuate the existing situation in which the Soviet Union might attack U.S. and Allied

space systems, believing that their space systems are not vulnerable to counterattack by a corresponding U.S. ASAT. Military exercises have repeatedly demonstrated that in the absence of a U.S. ASAT capability, if the Soviets attack and destroy one of our satellites, the United States has two choices, both of which are bad—to do nothing or to take some other military action that could be dangerously escalatory.

In addition to their various ASAT capabilities, and of even greater concern, the Soviets also maintain space-based reconnaissance satellites whose primary purpose is to locate and direct attacks against U.S. and allied terrestrial forces. These systems include ocean reconnaissance satellites which use radar and electronic signal monitoring to provide [deleted] over-the-horizon targeting data to Soviet naval weapons platforms which can quickly attack U.S. and allied surface fleets. [Deleted.]

Valuable targeting information would be used [deleted] to attack U.S. naval forces and to hamper U.S. efforts to reinforce its forces (such as those in Europe) during a crisis. We are, for example, by and large, a maritime nation that depends on the use of the sea, but our naval forces and troop transports could all be easily targeted by Soviet RORSATs and EORSATs. [Deleted.]

In short, our failure to deploy an operational ASAT creates a critical gap in our overall ability to deter war. We must be able to hold at risk Soviet space assets that are important to their ability to wage war, both conventional and nuclear. In this way, a sustainable and operational ASAT could be a very important factor in influencing a Soviet decision about whether to go to war. Should deterrence fail, the United States must protect our power projection and reinforcement assets from Soviet targeting. Having this war-fighting capability will add greatly to our deterrent posture.

Because of the continuing need for an operational U.S. ASAT capability, the President's budget for fiscal years 1990/91 contains robust funding to support various ASAT-related efforts. Our overall ASAT program relies on upgrades to the supporting space surveillance network, as well as a mix of surface-based kinetic and directed energy weapons programs.

As to the specifics of our program, the Air Force is the lead service for a single comprehensive space surveillance and battle management/C³ system that will control all ASAT capabilities and weapon systems. The Air Force is responsible for coordinating the integration of those weapon system elements.

The Army is the interim lead service for the kinetic energy weapon system and is establishing a Joint Program Office to develop, test, and produce a kinetic energy ASAT interceptor. The Army has provided a program manager, and the Navy has provided the deputy. At Milestone One, now planned for late 1989, the Department will review the lead service responsibility as well as the options for sea- and land-based kinetic energy ASAT versions.

For directed energy weapons, no joint program office has been created. The Army and the Air Force are independently investigating various directed energy technologies to prepare alternative concepts for an ASAT directed energy system selection in fiscal year 1991.

Mr. Chairman, probably no single technology will provide a complete solution to the threat we face from Soviet space systems. We need to have ASAT capability that is agile and responsive enough to meet the full range of requirements of U.S. force commanders in times of crisis or conflict. Such a capability would be a vital part of our force posture contributing substantially to our ability to deter both conventional and nuclear war and to protect our forces should conflict occur.

Senator EXON. Proceed, General Pihl.

STATEMENT OF LT. GEN. DONALD S. PIHL, U.S. ARMY, MILITARY DEPUTY TO THE ASSISTANT SECRETARY OF THE ARMY (RESEARCH, DEVELOPMENT AND ACQUISITION)

General PIHL. Sir, the joint representatives of the services are very pleased to be here today. We are here today to redress a dangerous and destabilizing situation. The Soviets possess the world's only operational ASAT system and they have maintained it in operational status, despite their testing moratorium.

They also possess, as the Ambassador pointed out, other ASAT capabilities with their nuclear-tipped GALOSH system that surrounds Moscow. They also possess space-based targeting satellites

that can affect war-fighting for land forces and our sea-based forces.

Our mission is deterrence, and a lack of a U.S. ASAT is a critical military deficiency. We must hold at risk the Soviet space assets. If deterrence fails, we want to deny the Soviets the over-the-horizon targeting and we want to possess the capability to respond in kind and avoid escalatory or ineffective responses.

The U.S. military has long had a requirement to negate threatening Soviet space-based reconnaissance satellites. Extensive technical expertise resides within the DOD and the aerospace industry for the development of kinetic energy and directed energy anti-satellite weapons systems. In recent years, the testing of the F-15 ASAT weapons system was impacted by congressional constraints.

The President's budget for fiscal years 1990 to 1994 contains robust funding for KE, DE, and the space surveillance network upgrades. Specifically, we are going to acquire a kinetic weapon. We have a Milestone Zero that has been approved, so we are in concept exploration.

We have a planned Milestone One, defense acquisition board, for December 1989. The Army has been selected as the interim lead. We have the program manager, General Jellett, who is immediately to my left and to the rear, and the deputy program manager is coming from the Navy.

At the Milestone One in December, we will review what the final lead is and also address the basing concept for these weapons, as to whether they will be land-based, sea-based, or both.

We are reviewing the ABM Treaty compliance for KE ASAT concepts by Milestone One, and we will review our basing options, as I said.

For the directed energy weapon, we have a Milestone Zero that has been approved. We are in concept exploration. We have a Milestone One DAB during the 1991 time frame to select a single directed energy ASAT concept.

Right now the Army is beginning development of the ASAT capability within the existing Strategic Defense Initiative free electron laser program through 1991, and the Air Force is continuing their directed energy ASAT weapons system technology efforts.

For surveillance and BM/C³, which Gen. Tom Moorman will address, the Air Force is responsible for those activities. The President's budget request is \$95 million in 1990 for the KE ASAT, \$38 million for the Air Force directed energy tech base efforts, \$15 million for the Army's free electron laser ASAT, and \$6 million for the surveillance network that the Air Force is responsible for.

Sir, I will be followed by Admiral Miller.

Senator EXON. Thank you, General.

Admiral.

STATEMENT OF VICE ADM. PAUL MILLER, U.S. NAVY, DEPUTY CHIEF OF OPERATIONS FOR NAVAL WARFARE, OFFICE OF THE CHIEF OF NAVAL OPERATIONS

Admiral MILLER. Mr. Chairman, distinguished members of the subcommittee:

This is my very first time for being over here, and I am grateful for this opportunity. I just returned a few months back from the U.S. Seventh Fleet and now my shingle is hung outside the door of the Deputy Chief of Naval Operations for Naval Warfare.

Naval warfare crosses all the lines, of which space is an important subset. Therefore, I am sitting here having the opportunity to address you today from the requirements side of the picture.

At the outset, I want to say that the Navy strongly supports a national ASAT program and an ASAT capability is needed to assure our war-fighting effectiveness. There is no question that a large portion of the Soviet space and recon effort is dedicated to maritime surveillance and reconnaissance.

We, the fleet operators—and I use the collective term “we” because I had the great good fortune of spending 3 years with our operating forces as a flag officer—1 year as a battle group commander and nearly 2 years as the fleet commander of the Seventh Fleet—operate in the environment and we are concerned with the Soviet space capability.

We have operated for some time with work-arounds. [Deleted.]

We are here to talk about the future, and that is what is troublesome, because we operate against peacetime constellations, for example the EORSAT and the RORSAT, but we expect them to add to these existing systems. We expect a surge capability in times of crisis and conflict.

We see steps from reconnaissance and surveillance to targeting, downlinks from space. You take the current capability and you add the forecast for the future and, in terms that are simply stated, in a maritime environment we do not want to see an uncontested space-based targeting capability against our ships, our sailors, marines and troops.

Secretary Wolfowitz has mentioned Soviet ASAT capabilities and without a similar capability we will be vulnerable in the maritime environment, and our operational commanders need to have that capability.

Regarding the sea-based option of the kinetic kill, the Navy is working with the joint program office and we are looking hard and we are working on putting together a sea-based option. We want to put forward a program that uses existing platforms and, if we do that, it will be a maritime platform that will be survivable and flexible.

[Deleted.] With these ships at sea and having a launcher system in hand, it could be a cost-effective option.

We have an office that has proven its capability at flying missiles and working the option. You have heard about the office. It is the Strategic Systems Program Office. It is the office that brought you Polaris, Poseidon, Trident, an office that since 1955 has done that kind of work and has done it very well.

Later this summer or early fall, whenever the call is to be made, we want to be able to put forward to the Secretary of Defense a fully looked-at sea-based option, and we are highly confident that we will be able to package an option that will be right on the mark.

And that concludes my few remarks, sir.
Senator EXON. Thank you very much.

Are we going to you now, General Moorman?

STATEMENT OF MAJ. GEN. THOMAS S. MOORMAN, JR., U.S. AIR FORCE, DIRECTOR OF SPACE AND SDI PROGRAMS, OFFICE OF THE ASSISTANT SECRETARY OF THE AIR FORCE FOR ACQUISITION

General MOORMAN. Yes, sir. Good afternoon, Mr. Chairman, distinguished members of the subcommittee. I am pleased to join Ambassador Wolfowitz and the Army and the Navy to speak about this great shortcoming which is the lack of an ASAT program.

As Ambassador Wolfowitz has pointed out, the Air Force role for this particular ASAT program is the BM/C³, battle management, command, control and communication, and the space surveillance network. I know this committee appreciates that the Air Force has long recognized the need for an ASAT capability, having fielded one in the sixties with the nuclear-tipped Thor and then later having developed and tested the F-15 Miniature Homing Vehicle.

General Pihl and Admiral Miller touched upon their respective services' roles, and that is primarily in the area of developing kinetic energy weapons systems and exploring, in the Army's case, the applicability of the free electron laser to the ASAT task.

Equally challenging in this area of developing a weapons system is to be able to put together a battle management program that is integrated into the existing strategic defense system of the United States, as well as the tactical warning and attack assessment system so to serve the national command authorities and the CINC.

The Air Force now, as you are probably aware, builds the space surveillance network and operates it. These are some 25 ground-based space surveillance systems deployed throughout the world that keep track of the space order of battle, looks after some 7,000 objects in space.

The Air Force also is responsible for developing Cheyenne Mountain, into which any ASAT program will have to be integrated. So it was appropriate that this responsibility be assigned to the Air Force.

General Pihl mentioned the Defense Acquisition Board that we will hold in December of this year. That is a Milestone One to look at where we are in the ASAT program. At that time we will decide on a basing mode, we will decide on a lead service, and for the Air Force's part we will also decide on the level of investment appropriate for the space surveillance and battle management system.

To lead to that, we have been doing exercises at Cheyenne Mountain against requirement scenarios, very taxing requirements scenarios, to run the space surveillance network against these simulated ASAT scenarios. Those are being evaluated now.

We will propose in December what improvements we will need to support either a ground- or a sea-based ASAT system. General Pihl also mentioned the ground-based laser program. Part and parcel of the Defense Department's ASAT system is the idea of a mixed weapons capability, that is, not only a ground-based or sea-based kinetic energy capability, but a laser capability as well.

The Air Force has long been involved in the laser business. We are pursuing several technology options, and in 1991 we will have a Defense Acquisition Board down-select what is the most appropriate, highest payoff laser for the ASAT task.

To conclude, sir, this country really needs an ASAT system for deterrence and, should deterrence fail, to prosecute war-fighting. It has been characterized in the past as one of the greatest Achilles' heels that this country has, and we need to rectify that shortcoming and asymmetry that we have.

Thank you very much.

Senator EXON. Thank you.

Let me begin the questioning, gentlemen, with this observation. I think generally speaking on this subcommittee we are going to be providing some ASAT funds, because we recognize the shortfall or potential shortfall that we have in that area.

ELIMINATING ASAT TESTING

But to try and put this all in perspective, let me ask you a question. If the Soviet Union were to advance tomorrow a proposition that we try once again to permanently eliminate ASAT testing, my first question to you is, when did the Soviets last test their ASAT capability?

Ambassador WOLFOWITZ. General Moorman, do you want to answer?

General MOORMAN. They last tested their ASAT in the summer of 1982, [deleted]. And they have stood down since then.

Ambassador WOLFOWITZ. Excuse me, Senator. It should be emphasized that is the last time they tested it as a full-up system.

General MOORMAN. That is right. Good point.

Ambassador WOLFOWITZ. But virtually all the components have been tested since then, particularly the missile, which is operationally used to launch all kinds of other satellites.

And I think I indicated in my testimony that the evidence indicates a very high level, an extraordinarily high level, of operational readiness for this ASAT capability that they have at Tyuratam. I mean, it is not the kind of readiness that you maintain just for a test program. It is the kind of readiness you maintain for a front line force.

Senator EXON. Then what you are saying is we should not be lulled into a false sense of security.

What you are laying the emphasis on once again is that it is just more, it is considerably more than just our lower orbiting satellites that they could do great damage to if they chose to, is that right?

Ambassador WOLFOWITZ. Let me take two separate points. The system that was last tested in 1982, but that we assess is operational today, is principally directed against low earth orbiting satellites. However, it should be emphasized that that includes the majority of our critical satellites. I mean, there are very critical ones at high earth orbit, but we are talking about a very important range of satellite capability.

Let me put it in perspective—this is a point I am told General Piotrowski makes with great eloquence, but let me try to do it a little less eloquently. To say that it was last tested in full-up capa-

bility in 1982, to put that in perspective, recognize that we have whole weapons systems deployed, including our entire ICBM force, that has never been tested from its launch point to its final target, the way their ASAT capability has been tested.

Many weapons systems are fielded based essentially on component testing, on testing more restricted, aiming at something that is not quite the actual target. So if you compare this overall with other systems, it has to be rated as fully operational.

On the question of the threat to higher altitude satellites, and particularly the geosynchronous ones, maybe one of my colleagues could address that better.

General MOORMAN. Right now the primary threat is to low altitude satellites. However, one must be concerned. We have focused on the co-orbital system. That is the one that has stood down, that Ambassador Wolfowitz has referred to.

They have also tested their GALOSH, which is an ABM system that rings Moscow, [deleted].

Senator EXON. When did they do that?

General MOORMAN. I have to ask one of the people in back. [Deleted].

Senator EXON. I want to ask another question, but go ahead.

General MOORMAN. They also have laser capabilities at Sary Shagan [deleted]. From that system we have obviously not gotten any indication of them lasting against us, but it is thought that that is capable against low altitude systems, and should they increase the power over the years they may be able to do damage against medium-altitude satellites as well.

Senator EXON. But they have not tested it?

General MOORMAN. [Deleted].

Ambassador WOLFOWITZ. On the GALOSH, Senator, we know it has been tested to altitude—it is an interceptor, as I think you know, that was designed and deployed principally for ABM purposes. [Deleted.]

And in fact, the Soviets have made statements about it being designed to defeat spacecraft and, in their words, conduct “a battle for supremacy in space.”

We will get for you, and for the record, the date of the last such test of the GALOSH.

[The material referred to follows:]

Information regarding such testing of the GALOSH ABM interceptor can only be provided as a classified answer.

[Deleted.]

Senator EXON. Thank you.

My time is up for the first round. I would like to go to questioning and give 6 minutes to each person. And I would yield to Senator Thurmond.

Senator THURMOND. Thank you very much, Senator Exon.

U.S. SPACE CONTROL CAPABILITIES

Mr. Wolfowitz, the fiscal year 1989 authorization bill has a request for the Secretary of Defense to provide the Senate and House Armed Services Committees with a report of U.S. space control ca-

pabilities. This report, which was due earlier this year, has not been sent to the committees.

Can you tell us why this report has not been sent to the committees?

Ambassador WOLFOWITZ. Senator, I am aware of the report that you are asking about, and I am aware of the long delay. I believe that we have now cleared away most of the bureaucratic obstacles to forwarding it here, and I would hope that it could be up here in fact in the very near future.

I believe the delays previously have been partly due to what you know has been a slow transition. I myself was only confirmed last month.

But also, there has been a legitimate concern about how all of this relates to our ongoing consideration of the important questions that Senator Exon raised about ASAT arms control. I think those concerns have been allayed and I believe we will be able to forward this report up here in the very near future.

Senator THURMOND. Can you also provide the committee with a summary of the reports conclusions and recommendations?

Ambassador WOLFOWITZ. We will certainly do that, and I hope we can provide you with the full report before very long.

ABANDONING ASATS

Senator THURMOND. Now, given the importance of an ASAT system, Mr. Wolfowitz, to counter Soviet satellites, thereby enhancing the survivability of our military force, particularly the naval fleet, is it in our national interest to enter into negotiations to ban ASATs?

Ambassador WOLFOWITZ. Is it in our interest to enter into negotiations to ban them, is that your question?

Senator THURMOND. Is it in our interest to abandon them?

Ambassador WOLFOWITZ. Senator, I have to be a little cautious about how I answer that question, because some of that question, that very question, is under consideration now. And I am going to have to defer to the President's ultimate decision.

I think we would all agree, though, that one of the critical questions is not only is it in our interest to have a ban—and that is a legitimate question for debate—but the second question is, is it possible to have a ban, given that on the Soviet side the cat is largely out of the bag, as we have said in describing the SL-11 system, the so-called co-orbital system.

They have already tested and deployed one, and it is not at all clear how you could even have an effectively verifiable ban. So that would be a further question. I have some concerns about that issue.

But I can get back to you with the definitive administration policy here before too long.

KINETIC ENERGY INTERCEPTORS

Senator THURMOND. Mr. Wolfowitz, how many kinetic energy interceptors do you plan to deploy, and who will have operational control of those systems if they are based at sea or in the continental United States?

Ambassador WOLFOWITZ. Those are questions, Senator, that in fact the present work is designed to clarify. We are at what is called Milestone Zero in the acquisition process, where we are developing the concept, including looking at the various benefits of land-based versus sea-based interceptors.

And it is at Milestone One, I believe—and I will ask General Pihl to speak to this as well—where the exact definition would be developed. General Pihl, do you want to comment?

General PIHL. Sir, at the present time if it is the ground-based solution, we would deploy 36 interceptors in two to three batteries of 12 to 18 missiles each. You could base those in the west of the United States—Hawaii, Kwajalein—and the locations would give us nearly worldwide coverage to be able to take out their low-flying satellites, as well as their co-orbital satellite on the first pass.

Senator THURMOND. General Moorman, in the Bush revised 1990–1991 budget there is \$20 million in the directed energy ASAT line to give the MIRACL system a limited ASAT capability. What is this limited capability? On what kind of orbit will this laser be effective? Specifically, what Soviet systems can this laser damage?

General MOORMAN. That is correct, sir. That is \$20 million against the MIRACL system, which is now in New Mexico. It will give us a limited capability against low altitude satellite systems, [deleted].

U.S. VERSUS SOVIET SPACE CONTROL CAPABILITIES

Senator THURMOND. General Moorman, can you provide the committee with a net assessment of United States versus Soviet space control capabilities, and what kind of 5-year plan do you envision to improve the U.S. space control capabilities?

General MOORMAN. We did a net assessment 2 years ago, which included the whole blue versus red net assessment—everything from space launch to surveillance through warning, communications, et cetera. [Deleted.]

That is, they could take our capabilities out, and they also could reconstitute. And finally, our surveillance systems, being very much overseas, were very vulnerable. So that is the area of greatest asymmetry that we concluded.

Senator THURMOND. Thank you, Mr. Chairman. My time is up.

Senator EXON. Thank you, Senator Thurmond.

Senator Bingaman is next.

MIRACL LASER

Senator BINGAMAN. Going back to the MIRACL laser for a moment, the upgrade of that which is proposed by the President in the budget. I am not clear what capability that gives us and how that compares to the capability the Soviets have with the lasers they have got at Sary Shagan.

General MOORMAN. I am going to have to take that one for the record, because I do not know enough about the Soviet capability to compare just exactly what their lethality is at what altitude.

[The information follows:]

COMPARISON OF MIRACL AND SARY SHAGAN

[Deleted.]

The MIRACL system, a megawatt-class chemical laser, is currently used for a variety of high-energy laser research purposes, including lethality and vulnerability testing and propagation studies. The upgrade proposed in the President's budget would modify the laser device to produce a better beam and improve the beam director to provide an acquisition and tracking capability against Soviet satellites [deleted.]

As a closing note, I need to mention that there are also other Soviet laser research facilities which are doing ABM and ASAT related work. The intelligence community has further information on these sites which could be provided [deleted] to interested members upon request.

Senator BINGAMAN. Can you give me any more information about the capability that the upgrade gives us, the MIRACL?

General MOORMAN. There are two types. The upgrade that we are funding now, the Air Force has provided \$8 million, and what that will be is toward generic improvements and testing out the technology.

Then in the following year we have \$20 million, which was alluded to by Senator Thurmond, to begin the upgrade of the system to give you a limited capability. [Deleted.]

It really is designed to fill the window of vulnerability and give us an interim capability, rather than being an end-all system.

Senator BINGAMAN. Do we have the ability with national technical means to monitor testing of that Soviet laser against objects in space?

General MOORMAN. I can get you more at a higher classification level, [deleted].

FREE ELECTRON LASER

Senator BINGAMAN. On the free electron laser, my information is that General Monahan decided to down-scale the free electron laser experiment and he is taking it from 10 megawatts to 1½ megawatts, and taking the optics from 3 meters down to 1 meter, I believe. This reduction I believe would significantly reduce the potential usefulness of that for ASAT purposes.

And I just wondered, is that a concern that you would have? Is anybody in the service worried about that downgrade?

General MOORMAN. Senator, if we can ask the program manager. General Jellett does not only the kinetic energy for the Army, but as well the FEL, and perhaps he can speak to that.

General JELLETT. The downgrade will affect the maximum range, but there still will be sufficient utility to do some of the interim testing that we would like to see in the low earth orbit regime.

So it will have some residual capability to address that. It will not have the full capability we would like to see.

Senator BINGAMAN. Were any of the folks who were involved in the development of this ground-based laser ASAT capability consulted by SDI in the decisionmaking that went into this decision to downgrade?

General JELLETT. No, sir. The decision was an SDIO decision.

Senator BINGAMAN. But they did not consult with folks concerned about ASAT capability in making that decision?

General JELLETT. No, sir, not directly.

Senator BINGAMAN. Is the impact that that decision has on our potential capability significant enough that it should have been something that you worried about or were consulted on?

It does not sound like a minor change when you go from 10 megawatts to 1½.

General JELLETT. The concept right now is to ensure that we have a leverage of development for a directed energy ASAT weapon system, leveraging off the SDI technology. The funding constraints General Monahan had has essentially left him with very little alternative to make the decision that he made. And again, the residual benefits that we will be able to achieve—we are not looking for that system to go directly to an operational weapons system, but rather to use it as a test bed and springboard for an eventual operational capability.

Senator BINGAMAN. How does the decision that General Monahan has made affect the Kendall report? Do we need to redo that report in light of Monahan's decision?

General JELLETT. I cannot answer that, sir. I will have to get back.

Dr. STANSBERRY. Senator, the directed energy ASAT program is structured to provide a decision point in 1991 to select among several ground-based laser ASAT options. The free electron laser is one of the candidates for that. The revised SDI program will still be able to support essentially all the technical questions that are being addressed between now and that down-select.

And I believe that the Kendall report, the primary utility of that report was to structure the programs, all of the laser programs, so that they support this 1991 decision. And in that context, I do not think it is necessary to redo that.

Senator BINGAMAN. One of the suggestions that has been made—I guess General Scowcroft participated in an Aspen report fairly recently when they suggest that perhaps it was impossible, because of verification problems, to do anything in the arms control area with regard to low altitude ASAT.

HIGH ALTITUDE CAPABLE ASAT

But they suggested that we should pursue negotiations on high altitude capable ASAT. Is that something—maybe that was addressed before I walked in here.

But I would be interested in, Mr. Wolfowitz, your opinion as to the appropriateness of us pursuing arms control with regard to high altitude ASAT.

Ambassador WOLFOWITZ. Senator, that is one of the specific types of limitations that we are currently looking at the interagency review. I think one of the biggest questions that comes up with that is again a question of verification: Can you have adequate confidence, given what they have tested already and how little additional testing would be necessary in such a ban?

But that probably has more promise than a total ban, and that is one of the things that we are looking at now.

Senator BINGAMAN. My time is up, Mr. Chairman.

Senator EXON. Thank you, Senator Bingaman.

Senator Glenn.

Senator GLENN. Thank you, Mr. Chairman.

ASCOT PROGRAM

I was over at DARPA a few weeks ago. I spent a full day being briefed on all their different projects. One project I was briefed on was an ASAT concept they call Ascot. Are you familiar with that?

General PIHL. Yes, sir, I am.

Senator GLENN. They claim that under this scheme this country could develop an effective ASAT using current off the shelf components. They said it makes sense, it is available now, and costs less.

What is your assessment of Ascot?

General PIHL. Sir, we have looked at the Ascot program in DARPA. It is a promising concept. You would have a targeting illuminator that would light up the target. You would have to have communications. These would be mobile radars that you would have to have in positive command and control, and then you would launch an intercept vehicle to where the illumination had occurred on the target.

We are working, of course, with General Moorman and the Air Force to have the targeting capability and control, and we will certainly look at the Ascot DARPA concept as one way to solve this kinetic energy ASAT capability.

Senator GLENN. You are having a Milestone One review of kinetic energy ASAT systems to be completed, I believe, not beyond the end of this year, by December 31, is that correct?

General PIHL. That is correct.

Senator GLENN. Will Ascot be considered in that?

General PIHL. It is one of the alternatives, yes, sir. It is a DARPA concept.

Senator GLENN. Okay. How many different types are you considering?

General PIHL. Well, principally, sir, we have the Exo-atmospheric Re-entry Vehicle technology, the ERIS, built by the Army's Space Defense Command down in Huntsville, and that is our main hitter in this exercise. It is a matter of packaging that with the three-stage rocket and having the capability to take out their co-orbital satellite, as well as the ability to knock down their satellites.

So the question in the DARPA concept, which is I think a simple approach to the problem, really gets down to the command and control link.

SR-71

Senator GLENN. I had a separate briefing on ASAT over in S-407 a few weeks ago. They made quite a case that, in the event that there was a war, the Soviets probably have a capability of taking out a fairly good percentage of our satellites right now.

Yet, despite this claim of the vulnerability of our space-based reconnaissance assets, the Air Force is canceling the SR-71, and that is the only truly survivable reconnaissance platform we have in our inventory if those Soviet ASATs work as our people think they will work. The SR-71 operates above SAM level and below ASAT level.

What on earth sense does it make to cancel the only thing we have if we went to war? It is a system that has proven to be an excellent system, still very valuable, and yet we are canceling it.

Ambassador Wolfowitz, what is the rationale for canceling the SR-71? It just makes no sense to me whatsoever.

Ambassador WOLFOWITZ. Senator, I am not sure I can answer that. General Moorman, maybe you can.

General MOORMAN. Well, Senator Glenn, that is not in my bailiwick. But the arguments that have been put forth for that is the tremendous costs and the ability to get that data—in operating the SR-71, and the ability to get that data with other means, new capabilities, national technical means.

Senator GLENN. For instance?

General MOORMAN. Sir, I believe that I would be more than happy to talk about that, sir—

Senator GLENN. I am familiar with the system that I think you are talking about.

General MOORMAN. Yes, sir.

Senator GLENN. And we may be out of our classification level here, you are right.

But what you are talking about on that system, I know what you are talking about. That is many years down the road and it is still a very speculative system, if it is the one I am thinking of.

General MOORMAN. No, sir. But I would be more than happy to stay afterwards, sir, and speak to you.

Senator GLENN. I do not buy it on cost either, because the cost that we are talking about to keep the SR-71 going is just a fraction of any of the systems we are talking about here, a tiny fraction compared to these things here.

A good system, it is one that is time-sensitive. We can use it or not use it. Stay time over target, multiple passes. I just think to do away with the SR-71 at this point is crazy.

The only reason that I have heard from the Air Force is that they do not like the expense of it because it is on their budget. They wish that somebody else was putting it on their budget, rather than the Air Force budget. And I can appreciate that and maybe something gets worked out on it.

But it just makes no sense whatsoever to me, with a flexible system like that, as good as that has been, to cancel that thing now.

Do we have any survivability features, maneuverability, or other things, that we can equip our next series of satellites for that would be less expensive than developing an ASAT and without effectively escalating an arms race in space?

Ambassador WOLFOWITZ. I think there is a range of things, Senator, that we can do to improve the robustness of our own capability. But I think at the same time, it is important to note that improving robustness by itself is not adequate. I think it is not a matter of escalating an arms race in space. The Soviets already have that capability. They have demonstrated that capability.

I think it is important, number one, that we be able to deter them effectively from using it, and I think also it is important for us to have the option of destroying their satellites in circumstances where that might in fact be more important to us.

I am not sure you were here at our opening statements. I think particularly about the concern—and I think in some circumstances the greatest concern about space systems—might be the threat posed by Soviet reconnaissance satellites to our fleet, and that is something we have become increasingly concerned about.

Senator GLENN. That was going to be one of my next questions, if I have any time left, about what kind of a threat that poses to the fleet. But that is surveillance. It is not an attack from that satellite; it is surveillance, right?

Ambassador WOLFOWITZ. That is right, but it is surveillance that is the critical missing link in the attack. Well, Admiral Miller is the best man to speak to that.

Admiral MILLER. The surveillance and reconnaissance in itself, of course, is something that one deals with. But when you transition to targeting, that is something that one gets concerned with. Having the ability to target our fleet units from space is one capability that we do not want to see happen, particularly a capability that would be unanswered if we do not have a similar capability.

I cannot underpin sufficiently strong enough the tactical vulnerability as you look to the future, as you credit them with having the ability to do more from space. And then, if they have the capability to deny us from using space, that is an equation that we do not want to be faced with from the operational vantage point.

I cannot repeat that too often with regard to the requirement for ASAT.

General MOORMAN. Admiral, can I add just one thing? Because we may have misled you a bit, sir. [Deleted.] It is not a passive system. It is tied into a targeting mechanism, and so it is very threatening.

Senator GLENN. Okay. Thank you. My time is up.

I just carry back the message on the SR-71. I think we really need to look at this, that I just think we have an existing system, we have a vulnerability that is going to knock out all the more exotic systems. This is the one thing we have left and we are going to do away with it. It does not make sense.

Senator EXON. Thank you, Senator Glenn.

Senator LEVIN.

Senator LEVIN. Thank you, Mr. Chairman.

SATELLITES IN HIGH GEOSYNCHRONOUS ORBIT

Senator Bingaman made reference to a writing of Scowcroft in which he said that the satellites that are most important to U.S. security are largely in high geosynchronous orbits, and that these higher altitude spacecraft are not now at risk to prompt threats. Do you agree, Mr. Wolfowitz, with Brent Scowcroft's statement?

Ambassador WOLFOWITZ. Well, I do not want to be put in a position of disagreeing with it. I have not seen that particular one, Senator.

I think there is a range of satellites, a very considerable number of important satellites, including our [deleted] in low earth orbit. I think what General Scowcroft—or if it was a committee, the committee—was probably referring to is that if you are going to single

out the most critical satellites, they might be our Ballistic Missile Early Warning Satellites, and those are in geosynchronous orbit.

But the great bulk of our satellites are in low earth orbit. Maybe in a minute we will be able to get you the figures. Those include some of our most critical capabilities.

We would be in very deep trouble if we lost everything that is in low earth orbit.

HIGH ALTITUDE SPACECRAFT

Senator LEVIN. Would you agree that the high altitude spacecraft of ours are not now at risk to prompt threats?

Ambassador WOLFOWITZ. Not now at risk to prompt threats? I think that is fair.

Senator LEVIN. He also wrote that the Soviet system, the ASAT system, is a very crude system. Would you agree with that?

Ambassador WOLFOWITZ. I do not want to get in a fight with General Scowcroft.

I do not think you have to be sophisticated to shoot down a basically fairly soft target in space. It proved capable in its roughly first [deleted] tests, I think, of getting the target [deleted] times. That is a lot better than the Sparrow missile that we had going for 15 or 20 years.

SOVIET ASAT SYSTEM CRUDE

Senator LEVIN. Putting aside who said it, you do not agree that the Soviet ASAT system is a very crude system?

Ambassador WOLFOWITZ. I think that would be a misleading characterization. I think it is more important to say that it has achieved a [deleted] kill probability against its intended targets, whether by crude means or sophisticated means. It works.

Senator LEVIN. Would you agree with the statement that the Soviet system would require 2 weeks or more to destroy any substantial number of U.S. satellites?

Ambassador WOLFOWITZ. [Deleted.]

Senator LEVIN. And that that slow pace would give its targets opportunity for evasive action? [Deleted.]

Ambassador WOLFOWITZ. [Deleted.]

Senator LEVIN. Would you agree with this statement, that our interests weigh heavily in favor of suppressing all development of ASAT capability at high altitude?

Ambassador WOLFOWITZ. I would want to think about that more, but my instinctive reaction is that if we could verifiably and effectively suppress high altitude ASAT capability, that probably would be in our interest. But that is a large condition at the outset.

If it is not verifiable, then you end up with a one-sided limitation that you have to worry about.

BANNING HIGH ORBITING ASATS

Senator LEVIN. So that, assuming verification is adequate, then you believe it is in our interest to ban all high orbiting ASATs? At this moment in your career, you believe that?

Ambassador WOLFOWITZ. Right. My hunch at the moment, Senator.

Senator LEVIN. Before you hear who disagrees with you, is it your own personal opinion? Is it your own personal opinion at this point in your career?

Ambassador WOLFOWITZ. Uncluttered by a large number of facts, yes, Senator.

Senator LEVIN. Right, including who it is that is giving you direction. That is understandable. But is it your own personal opinion at this point that we would be better off, assuming verification, with a ban on high orbiting ASATs—on ASATs with capabilities against high orbiting satellites?

Ambassador WOLFOWITZ. Yes, but that is subject, Senator, not only to somebody else telling me differently, but also a better appreciation of the facts. Any of my colleagues here might have a different view.

VERIFICATION

Senator LEVIN. Well, do your colleagues want to comment on that? Assuming verification, would we be better off with a mutually verifiable ban on ASATs with capability against high orbiting satellites?

General Moorman, why do we not start with you.

General MOORMAN. My dilemma with that is your assumption. I have trouble, having spent a good percentage of my career in that verification business—

Senator LEVIN. I understand. Here is my assumption. Given my assumption.

General MOORMAN. There are probably some advantages to the country.

Senator LEVIN. On balance?

General MOORMAN. On balance. But a verification nightmare, Senator.

Senator LEVIN. I understand.

General Pihl?

General PIHL. Sir, I would agree. And the low-flyers, of course, that is the threat to the sea-based and land-based, and that is the principal concern of the panel here today.

But if you take a look at what we have up there and its state of maturity and how hardened it is and the ability to knock it out, it would probably be in our best interest to leave those satellites alone on both sides.

Senator LEVIN. I would recommend to you, by the way, Mr. Wolfowitz, this piece that was written by General Scowcroft and some colleagues of his. It has been quoted at some length by some various people. It seems to represent his views on this, and I would think that those would be of some significance to all of us.

At any rate, it was an introduction to a 1987 Aspen Strategy Group study called "Seeking Stability in Space." Those quotes I was making reference to were from that introduction. I think you know his colleagues on that introduction: Bill Perry, Joe Nye. I do not know who the other one was. Those were some of his colleagues.

It seems he made statements that you disagree with, and I think we ought to—I am certainly now interested particularly in pursuing where he makes flat-out statements, apparently, [deleted].

SOVIET CAPABILITY GROWTH

Maybe things have changed in the last 2 years. I am not sure. Has anything changed in the last 2 years? Let me ask that question. Has the Soviet capability grown in the last 2 years?

General MOORMAN. I think the thing that—I cannot speak to what his knowledge base was, sir. But the thing that gives me difficulty with that statement is that we have seen them turn SL-11 vehicles [deleted]. If you translate that—that is the vehicle. [Deleted.]

And you characterize that over a period of time; they can definitely draw down a greater capability in a shorter period of time than what is presumed in that statement.

Senator LEVIN. Thank you.

My time is up. Thank you, Mr. Chairman.

Senator EXON. Thank you very much, Senator.

FUNDS FOR ASAT PROGRAM

General Pihl, I am sure that you are not responsible for this, but I am afraid that, since you are now head of the ASAT program, that you will have to bear the brunt of the question and the concerns about the source of funds that you are using for fiscal 1989 for the ASAT program.

Last year we were told that all of the funds out of the old MHV ASAT program had to be used for contract termination costs, except for \$16 million. The Congress then took that so-called prior year funds in the budget process last year. Yet, somehow it seems that you have \$8 million this year—that is, fiscal year 1989—to start a new ASAT program. I am told that half of that money came from the old ASAT program.

My question is, was Congress misled about the amount of money left in the old ASAT program last year? Or how did your program come up with \$8 million without asking Congress for the money?

Before you answer, I want to remind you that below-threshold programs have to be submitted to Congress when the affected programs are congressional interest items, and surely ASAT is a congressional interest item.

General PIHL. Sir, I am aware that the money, as we were putting the office together, was transferred from 1988 program funds that were carried over. It was transferred from the Air Force to the Army. The Army is using it for the purpose of ASAT only.

And we were remiss in not notifying the Congress of our intent to use that money.

Senator EXON. Then is it true that there was more than \$16 million left over that had been programmed previously?

General PIHL. Sir, I personally cannot track that. As the appropriations director for those funds, I was on the receiving end. I moved that money to my program office.

Senator EXON. And you were glad to get it, and you did not worry about where it came from, is that right?

General PIHL. Yes, sir, that is correct.

Senator EXON. Is there anyone among the witnesses or anyone sitting behind the witnesses today who can answer that question for me? Where did this money come from?

You said we should have been notified, but we were not. Where did the money come from?

General MOORMAN. The source of the funds are, as General Pihl has indicated, sir, we did have \$20 million in prior year 1988 F-15 MHV funds that were being used for advanced ASAT studies which had been directed in authorization language in 1988.

As such, we were looking at the very specific subjects of kinetic energy, SDI, derivative kinds of solutions to the ASAT problem. When we performed the general officers study to come up with what the shape of the DOD ASAT program would be, it was decided that that should be a source of funds to continue with kinetic energy studies, as we have been doing before congressional direction, and take money from that and use that as an additional input to get the Army KE system ongoing.

Senator EXON. I was under the impression that that \$16 million was gone because we took it after you reported to us and used it for other programs, is that not right?

General MOORMAN. No, sir.

Senator EXON. What?

General PIHL. I think, sir, we arrested the actual expenditures and there was enough left to transfer to get us started, are the facts. We took a look at what was available that had not been executed.

Senator EXON. We were not advised of that, General Pihl, and is that what we should have been advised of?

General PIHL. That is correct, sir. You were not advised and you should have been.

Senator EXON. All right.

SPACE COMMAND REQUIREMENTS FOR ASAT

Dr. Wolfowitz, I am told that— maybe I am wrong, but I am told that the Space Command has set ASAT requirements for sweeping the sky of any adversary satellite within a very short period of time.

I guess that that would be to almost anyone the definition of space control, if you can get it done, that we would like to have. Is that a reasonable goal at the present time in terms of availability to satisfy at affordable cost, as well as in terms of overall policy?

Ambassador WOLFOWITZ. Senator, I believe that is the JCS long-term requirement. I believe the present program is being structured for the near-term requirement that has been established by CINCSPACE, but General Moorman can speak to that in more detail.

General MOORMAN. Ambassador Wolfowitz has it right on, sir. That is—and you characterized it just right, as a goal; that ultimately what you would want to do is sweep the skies clean of Soviet space force structure.

That clearly is not realizable in any of the technologies that we are pursuing, and as a consequence we down-scoped from that to a more realistic goal for our near-term requirement, [deleted].

That is the requirement set, Mr. Chairman, against which General Pihl and Admiral Miller are designing their systems.

Senator EXON. I am going to answer my own question and see if you agree with it—that is the long-term goal and we would all be delighted if we could achieve that. Given what we know today on technology and given the budget, that is not realistic on a near-term basis?

General MOORMAN. No, sir, it is not. My personal belief is you would have to go to a space-based solution to be able to do that in anywhere near the time frames that are envisioned.

SOVIETS AHEAD IN AN ASAT WAR

Senator EXON. Dr. Wolfowitz, if the Soviets can replace whatever they use, while we cannot, and if we depend more on satellites than they do, which I think has been the thrust of the testimony, it appears that the Soviets would come out ahead in an ASAT war.

Is that true? Why then do you think that an ASAT would be an effective deterrent? Or are you saying that, while the thrust of my question is true today, that we must move ahead very aggressively to see that that is not the place that we are put in?

Ambassador WOLFOWITZ. I think more the latter, Senator. Basically I would say two things. Number one, to the extent it is true—and it may be true—that we depend on space more than the Soviets and they can reconstitute their space system more rapidly than we can—

Senator EXON. Well, that is true, right?

Ambassador WOLFOWITZ. Well, it is certainly true that they can reconstitute more rapidly than we can. In some circumstances—it really depends on the circumstances—it may also be true that we need space more than they do. But let me come back to that.

It very much depends on circumstances. But there is no question, if they think they have the capability to shoot down our satellites and we have no capability to shoot down theirs, it is not a matter of starting a conflict in space. It is a matter that they will start feeling that they have a completely free hand.

Senator EXON. In other words, we have no deterrent, so to speak?

U.S. VULNERABILITY

Ambassador WOLFOWITZ. We surely need a deterrent if we are in the position you describe, where we are more vulnerable and more dependent.

Senator EXON. Well, is that not true?

Ambassador WOLFOWITZ. Let me just say—we are certainly more vulnerable. Whether we are more dependent or not comes to this question of what the circumstance is. And let me take the example that really comes from Admiral Miller's experience with the Seventh Fleet.

If we were in a crisis where the main focus was naval forces and a confrontation of naval forces, then as a matter of fact the main

relevance of satellites, the most immediate relevance, would be as an offensive weapon against surface ships.

And then they would need their satellites and we would like to get rid of them, and that is another reason that we would like to have this anti-satellite capability. So that, depending on the circumstances, we either can deter them, if that is in our interest, or we can get control, if that is in our interest.

And I do not think you can say ahead of time exactly which conflict situation is going to be which way. This naval vulnerability is critical.

Senator EXON. My time is up. Let me ask you one question that runs through my mind. If we are as vulnerable today in this area as you have testified and as others have testified—and I agree on that—if there is good news, though, this is where our strong triad would come in, would it not, to give them cause for concern?

If they start taking out our satellites, for example, that would be a pretty clear indication of what was going on? Is that not a case where our triad would come into play and be a cause of concern to them before they start taking out satellites?

Ambassador WOLFOWITZ. I think that is essentially right, Senator. But let me try again, to illustrate why we view it as a somewhat complicated situation.

You have got one set of satellites that are Ballistic Missile Early Warning Satellites, that are these very high altitude ones that are important for warning for our strategic forces, because they would give warning of a Soviet missile attack, and I think those are the ones that in fact today we view as probably not vulnerable.

But your point here is correct, I think, that if the Soviets did have the capability to take out those warning satellites, we are not so dependent on warning that our whole triad would collapse and you would lose its effectiveness.

On the other hand, if you take our Navy, not immediately today perhaps, but as soon as the more advanced Soviet tracking and targeting satellites are deployed, there it is just the other way around. There the threat to our forces comes from their satellites, and our vulnerability comes if we cannot take those satellites out.

So that is why again I said before, you cannot say for all circumstances whether we have an advantage in space or they have an advantage in space. I think you are absolutely right, the triad is not so dependent on warning that we are dependent on space for the survivability of the triad.

Senator EXON. Thank you.

Senator THURMOND.

Senator THURMOND. Thank you, Mr. Chairman.

AIR FORCE DIRECTED ENERGY PROGRAMS

Mr. Wolfowitz, could you please give us an overview of the different directed energy programs that the Air Force has, that the Air Force and the Army are currently engaged in, that would have some ASAT capability or be dedicated ASAT systems?

Ambassador WOLFOWITZ. With your permission, sir, I will ask General Pihl to answer that question.

General PIHL. Sir, the Army system is managed by our Space Strategic Defense Command in Huntsville, and it is the free electron laser. We are developing the laser and the relay mirror technology for a ground-based free electron laser capable of ASAT and ballistic missile defense missions.

In the SDI portion that the Army gets of that budget in 1990, we will spend \$206 million in R&D to do that, \$15 million of which is related to the ASAT system. That is the leverage from the SDI program that we talk about.

General Moorman can speak for the Air Force.

General MOORMAN. While the Army is working the free electron laser, Senator Thurmond, the Air Force has long been working excimer lasers, as well as oxygen-iodine lasers. In addition, we have had a technology line that worries about things such as beam control, that is sharpening the beam to get a good, fine, coherent beam.

We have also been working on atmospheric compensation, and that is that when you fire a laser beam into the atmosphere it scatters, very much like a flashlight in a fog, for example. And what you have to do to be able to put a coherent lethal beam on a satellite, you have to be able to lick and understand the behavior of the atmosphere on your laser beam.

We are spending, this year, on the order of \$59 million. Our level of effort in the out years is about \$45 million to that end.

As we mentioned, sir, in 1991 the Defense Department will hold a Defense Acquisition Board so as to down-select between the Army and the Air Force as to which of these technologies should we pursue for a ground-based laser ASAT.

Senator Thurmond. Thank you.

CONTROLLING ASAT OPERATIONS

Mr. Wolfowitz, in your prepared testimony you stated that the Air Force is the lead service for a single comprehensive space surveillance and battle management system to control ASAT operations. What space surveillance and battle management system is necessary to control ASAT operations?

Ambassador WOLFOWITZ. General Moorman.

General MOORMAN. If you start at the very top in the hierarchy, these systems will be controlled by the national command authorities and executed by the CINCSpace or General Piotrowski. He will do that in Cheyenne Mountain [deleted].

For Cheyenne Mountain, you have a space defense operations center, which is a command center from which General Piotrowski will fight the ASAT war. Right now that space center—and there has not been a total blessed concept of operations yet, but into that center he is getting all the inputs from the various space surveillance—ground based space surveillance capabilities, as well as the intelligence, [deleted].

All of this comes in and gets focused in the space defense operations center. My impression is that what he will do is, once the President, the national command authorities, have made the commitment that they want to draw down a Soviet ASAT, then he would compute the engagement profiles, determine which of the

weapons systems that he might have, be they ground-based or sea-based, and pass that tasking down to the Army or the Navy, who have an intermediate command center prior to getting to the actual weapons systems.

The battle management and space surveillance upgrades that you require we are studying now to make sure that that is a timely and efficient process.

ATTACKING SOVIET SPACE LAUNCH FACILITIES

Senator THURMOND. General Moorman, some military analysts have argued, instead of building an ASAT system to attack Soviet space control capabilities, we should target Soviet space launch facilities to deny them the ability to reconstitute their space assets.

Do you think attacking Soviet space launch facilities is a good substitute for the U.S. deployment of an ASAT system?

General MOORMAN. I will have to take a page out of General Piotrowski's book more than mine as a non-operator. The dilemma with attacking their three sites—that is, Tyuratam or Plesetsk or Kapustin Yar—is that that would be a major escalation on the homeland of the Soviet Union.

And the difficulty with that is the rapid escalation to a major global nuclear war. Right now, one of the great concerns that General Piotrowski has is, in the absence of an ASAT capability to respond in kind, he is left with either registering a strong complaint or trying to take out a shipboard surveillance system or escalating all the way to a homeland attack.

In his view as an operational commander, there is too much gulf between that, and he believes he needs a capability to respond in kind to control escalation as well. That is an unsatisfactory view, I think, to have to attack the homeland of the Soviet Union to draw that down.

Senator THURMOND. You have to be careful there; you might start a war.

General MOORMAN. Yes.

Senator THURMOND. I see my time is up.

Senator EXON. Thank you.

Gentleman, we will have additional questions for each of you, I believe, for the record. We would ask that you respond as quickly as you can to those for the record.

[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR J. JAMES EXON

ATTACKS ON SOVIET SPACE-BASED TARGETING SATELLITES

Senator EXON. The Navy argues that we must have an ASAT in order to destroy Soviet ocean reconnaissance and targeting satellites in wartime. If we destroy those satellites, the Soviets logically would attack our critical assets. Are you willing to trade our satellites for the Soviets' ocean reconnaissance satellites?

Ambassador WOLFOWITZ. The question blurs two issues which should be addressed on their own merits: first, the ability of our satellites to survive ASAT attacks against them and second, the use of a U.S. ASAT to attack Soviet targeting satellites. Active and/or passive measures are required for the protection of satellite systems functions across the spectrum of conflict. The amount, type and mix of protective measures are dependent on specific space system missions. The incorporation of survivability measures is an evolving process which must address existing, emerging or unknown threats. Therefore, the incorporation of survivability measures is not

solely dependent upon Soviet ASAT weapon capabilities, but the diversity of Soviet threats which can disrupt, degrade or destroy U.S. satellites.

On the second point, the Soviets maintain space-based targeting satellites whose primary purpose is to locate and direct attacks against U.S. and Allied terrestrial forces. Valuable targeting information provided by these space-based targeting satellites would be used by Soviet cruise missile carrying submarines and surface ships and by Soviet naval aviation to attack U.S. naval forces and to hamper U.S. efforts to reinforce its forces (such as those in Europe) during a crisis. We are, for example, by and large, a maritime nation that depends on the use of the sea, but our naval forces and troop transports could all be easily targeted by Soviet space-based targeting satellites. We must be able to hold at risk Soviet space assets that are important to their ability to wage war, both conventional and nuclear. In this way, a sustainable and operational ASAT could be a very important factor in influencing a Soviet decision to go to war. Should deterrence fail, the United States must protect our power protection and reinforcement assets from Soviet targeting. Having this war-fighting capability will add greatly to our deterrent posture.

DEPENDENCE ON SATELLITES

Senator EXON. In a NATO-WARSAW PACT conventional war, would NATO fare better or worse if both the Soviets and the United States lost all their satellites to ASAT attacks?

Ambassador WOLFOWITZ. This question raises the issue about whether the United States or the Soviet Union depend on satellites more. Both the United States and the Soviet Union depend heavily on space systems for such key functions as communications, missile launch detection, navigation, surveillance and environmental monitoring. The Soviets have thoroughly integrated these vital space support functions into all aspects of their operational planning, and their peacetime as well as wartime military operations. While the Soviets have maintained terrestrial alternatives to some space systems, they fully recognize that the speed, accuracy and wide area surveillance capabilities of space systems are superior, especially in time of war. If we were in a crisis where the main focus was naval forces and a confrontation of naval forces, then as a matter of fact the main relevance of satellites would be an offensive weapon against surface fleets. The Soviet Union would undoubtedly rely heavily upon their space-based targeting satellites to locate and direct attacks against U.S. and allied terrestrial forces. In such a circumstance, a U.S. ASAT capability would be a critical factor in our ability to hold at risk Soviet space assets that are important to their ability to wage war, both conventional and nuclear. In this way, an operational U.S. ASAT could be an important factor in influencing a Soviet decision about whether to go to war.

IMPORTANCE OF SATELLITE SURVIVABILITY

Senator EXON. Would you agree that satellite survivability is just as important an element of space control as an ASAT? If you do agree, why hasn't the administration requested a correspondingly ambitious initiative to correct our serious vulnerability problems?

Ambassador WOLFOWITZ. Space control, the ability to ensure access to, and provide freedom of action in space for friendly forces, and to deny the same to an adversary, requires an integrated combination of space surveillance, anti-satellite capabilities, and survivable and enduring assets. Therefore, I agree that active and/or passive measures are required for the protection of satellite systems functions across the spectrum of conflict.

Estimating the amount spent each year for survivability of U.S. satellites, however, is complex and not easily quantified. Many improvements made to existing satellites involve increases in performance as well as increased survivability. Therefore, many upgrades to satellite capability, either through changes to a current system or by introduction of a new block or system, provide both performance and survivability enhancements in non-separable ways. This in-turn makes estimating the true expenditures for survivability features difficult and potentially misleading. Satellite developers and operators are continually improving the survivability of their systems to meet the goal of assured mission capability. We are constantly assessing a variety of measures to enhance the survivability of our space systems from design and development through operation.

ALS AFFORDABILITY

Senator EXON. Last year the Office of Technology Assessment study of space launch options concluded that ALS could not be justified on cost-effectiveness grounds given the level of projected costs for the system. What kind of progress have you made in bringing ALS development costs down from the \$18 billion level that OTA assumed? Do you believe that peacetime cost-effectiveness is the right standard by which to measure the program's worth in any event?

General MOORMAN. The OTA's conclusion on life cycle cost effectiveness of ALS referred to an advanced technology vehicle with a hydrocarbon fueled flyback booster and a hydrogen fueled core including a propulsion/avionics module recovered from orbit. The \$18 billion estimate was for non-recurring cost associated with a hypothetical "expanded" mission model. For "growth" and "low-growth" mission models the estimate ranged down to \$15 billion and \$14 billion respectively. OTA selected this high investment, advanced technology "ALS" based on the conclusion that the high tech approach would be needed to comply with congressional appropriations and authorization language requiring ALS to pursue a \$300 per pound to low earth orbit recurring cost goal. OTA also described a "Transition Vehicle" with nonrecurring cost ranging from \$8 billion to \$13 billion for the "low-growth" up to the "expanded" models. This Transition Vehicle was essentially a low-tech ALS. OTA concluded that the most life-cycle cost effective alternative over the range of mission models and estimation uncertainty was the Transition Vehicle when compared not only with a flyback booster ALS, but also with Shuttle-C, Titan IV, Shuttle II or derivatives of existing expendable vehicles. The progress we have made in bringing the ALS development costs down has been in refining the concept of ALS in line with the OTA's observations. We have discarded fly-back boosters and hydrocarbon engines and substantiated dramatic cost reductions available within readily available technology. Our emphasis has not been limited to reducing investment and recurring costs nor has it been on heavy lift vehicles alone. The major funds of our requirements and our design activity has been in improving the operability, that is to say, the responsiveness, reliability, resiliency, and dependability, of a family of launch systems across the range of payload size and launch rate. Peacetime cost-effectiveness is an important criteria for judging a launch architecture's worth. It is not the only one. The ability to dependably sustain operations and satisfy mission requirements must be balanced with affordability. Affordability considerations should be a balance of life cycle and near-term investment concerns for real missions, not a mandatory \$300 per pound goal for hypothetical large mission models. The "ALS" versus "Transition Vehicle" confusion in the OTA report illustrates the danger of restrictive language that overemphasizes one figure of merit.

REQUIREMENT FOR ALS

Senator EXON. Will there have to be a requirement for a payload that weighs significantly more than what the Titan IV can lift in order to justify fielding ALS by around the turn of the century? In other words, can ALS development be justified by reference to all the deficiencies in our current systems highlighted by the Unified Space Commander?

General MOORMAN. The question reflects a common misperception that the ALS program is a heavy lift program rather than a family of vehicles. We will be considering ALS size and schedule for development in the context of overall national requirements at the Defense Acquisition Board Milestone One review next year. Air Force Space Command, the unified command's Air Force component, has documented in the ALS Mission Need Statement and Statement of Operational Need, requirements for more affordable and operable space launch over the entire range of launch vehicle sizes. These requirements reflect their allocation of requirements to the launch segment in achieving assured mission capability. Today's launch vehicles, at \$3,500 per pound to low earth orbit, are too expensive. With launch call-ups of 90 to 180 days and complex payload interfaces and processing, they are unresponsive to war-fighting commanders. To change the situation will require a generational change in both payloads and launch vehicles. The turn of the century represents the earliest opportunity to field a new ALS family of vehicles and the opportunity to transition payloads to ALS at block changes and new starts. The validated requirements and the cost of launch justify the development. Affordability and priority will determine the timing, scale and path to fielding a new family of ALS vehicles.

BUILDING SATELLITES CHEAPER

Senator EXON. Do you believe that satellites could be built significantly cheaper than they are today if the designers had more weight and volume in the launch vehicle to work with? For example, they could avoid having to make the antennas and solar panels fold up to 150 times to squeeze them into a small space—that sort of thing. Alternatively, based on experience, if you give satellite builders more weight and volume they just eat it up with new capabilities. Which do you think would happen if we gave them more weight and volume, say with an ALS vehicle?

General MOORMAN. Based on preliminary estimates from several satellite builders looking at potential benefits of ALS, including Hughes, Boeing, Lockheed, it is certainly possible to build satellites at lower cost if weight and volume constraints are relaxed. Past history on satellite weight and cost shows that the weights inevitably increase over initial predictions or past performance, and we are forced to undertake expensive weight reduction programs to fit within the intended launch vehicle's lift capability. To reduce the weight, design margins are sacrificed, and the satellite structure and launch vehicle interfaces are customized to the specific characteristics of the intended launch vehicle. Because of this dependency on booster characteristics, upgrade of the booster or transition to another, more capable vehicle is ruled out by the high cost of having to requalify the satellite design. As a result, we are trapped with high costs and unresponsive, customized operations. Some of this is due to the addition of capability or of additional missions to the satellite. Because of the high cost, long development lead time and infrequent opportunity for satellite new starts, there is a natural desire to pack as much capability as possible onto every platform. Adding capability adds to the cost and weight problems which reinforces the desire to add capability. ALS represents a real opportunity to break this cost/capability spiral and produce more affordability and operable space systems. The solution to the cost/capability spiral is not purely a matter of disciplining our appetite for performance and maintaining adequate margins available with a more capable vehicle. The key is in removing or decreasing the sensitivity of cost to change. The ALS modular family of vehicles with standard interfaces and processing will avoid the unique booster type and tail number trap and make launch costs less sensitive to satellite weight and specifics. The user's requirements on ALS for responsiveness and operability will require payloads to adopt similar interfaces and processing. ALS lift capability and affordability will in turn allow the payloads the design margin to make their designs more responsive, more robust and therefore less sensitive to change. If ALS were simply a marginal upgrade of existing lift capability, there would be little hope for realizing the benefits to the payloads. Because it is a clean sheet approach to better operability and routine operations in contrast to today's environment of continuous development engineering, there is every reason to expect substantial improvement in satellite and launch costs, responsiveness and dependability.

DEFICIENCIES IN THE NAVY'S UHF FOLLOW-ON SATELLITE

Senator EXON. Do you think it might have been short-sighted of us to have designed the UHF Follow-on Fleet Communications Satellite with no jamming resistance and no protection against physical attack? Do you think it is possible to combine somehow the follow-on to the Navy's UHF and the follow-on to the Air Force's DSCS? I mean by that a common system with various communications and packages that has a lot of capacity, high jam resistance, and physical survivability?

General MOORMAN. The Navy's UHF Follow-on Communications Satellite was designed with both jamming resistance and protection against physical attack in mind. Both the Super High Frequency (SHF) command and fleet broadcast uplinks are jam resistant and meet the current jamming threat. This capability is based on the proven anti-jam features of the FLTSATCOM and LEASAT programs and complies with command and fleet broadcast requirements of the Joint Chiefs of Staff memorandum dated May 13, 1988. Jamming resistance will be further enhanced with the planned implementation of an Extremely High Frequency (EHF) capability including command, three broadcast and seven communications channels on UHF Follow-on satellites four through nine. There has never been an anti-satellite capability demonstrated against satellites in a geosynchronous orbit. There is, however, a secondary threat imposed by an exoatmospheric nuclear detonation in the proximity of satellite. The UHF Follow-on design meets the nuclear survivability requirements specified in "The Use of Space Systems in Threat Environment," SM-416-84, of July 9, 1984. Combining the Navy's UHF and the follow-on to the Air Force's DSCS can not provide additional jamming resistance for the UHF Frequency band. We believe the UHF Follow-on design currently provides adequate physical surviv-

ability suitable for the mission and is consistent with the DOD Military Satellite Communications architecture.

ASAT AND SPACE CONTROL

Senator EXON. DOD has decided that it is necessary to achieve a "hard kill" as opposed to a "soft kill" of enemy satellites with directed energy systems such as lasers. For a so-called "soft kill," all that is necessary is to destroy the satellite's solar arrays and other vulnerable external systems. Why is it necessary to do more than that to defeat the satellite? After all, a satellite without power and antennas cannot function very well for very long.

General MOORMAN. DOD believes that both "hard kill" and "soft kill" capabilities are useful options for military planners. DOD has proposed an ASAT program with both kinetic energy (KE) and directed energy (DE) ASAT weapons: while the KE system is definitely a "hard kill" capability, the DE system could span the range from "hard" to "soft kill," greatly complicating an enemy's efforts to defend their satellites. As noted above, though a "soft kill" can negate an enemy satellite, there are several reasons why a "hard kill" capability is also desirable. First, there is the promptness of a "hard kill," which immediately negates the enemy satellite capability. Effects of a "soft kill" may take several hours or even days to completely negate a satellite capability. Second, a "hard kill" provides an unambiguous signature which allows simple assessment of whether an effective negation has taken place. "Soft kill" of a satellite may require continuous close monitoring of the satellite to insure it is not just partially damaged, or even simulating a damaged state while still performing its mission. Third, "hard kill" works against all satellite targets, while "soft kill" is not always effective since not all satellites have solar cells (e.g. RORSAT), and antennas can be hardened or stowed/shielded for short periods while over weapon sites. Fourth, "hard kill" of a satellite requires minimum knowledge of satellite orientation and virtually no knowledge of the internal workings of the target satellite. Conversely, "soft kill" mechanisms usually require greater knowledge of the satellite's orientation and internal operation. For example, "soft kill" of a target by a laser requires considerable knowledge of target vulnerabilities (what to aim at), target attitude/orientation (where to aim), and laser beam position on the target (how well it is actually aimed) to accomplish closed-loop precision pointing of the beam onto vulnerable parts of the satellite.

ANTI-SATELLITE (ASAT)

Senator EXON. Could you explain to the committee how you plan to spend \$100 million this year when the program is just starting? Just this week, for example, I read that the Army has asked contractors for technology ideas, which *sounds* as though you are far from the point of spending significant funds wisely.

General PIHL. Efforts for the remainder of fiscal year 1989 will concentrate on primary study efforts that include the development of the Cost Effectiveness Operational Analysis (CEOA), program management planning, completion of the operations concept, deployment and employment options, and a detailed treaty compliance review. In fiscal year 1990, the budgeted \$95 million will be efficiently used for ASAT development. We are very familiar with ASAT technology as a result of our SDI related program work. In fiscal year 1990 we will continue conducting engineering analyses, system effectiveness, and will conduct a cost and operational effectiveness analysis to support a Milestone One decision during the first quarter of fiscal year 1990. After Milestone One approval, we intend to competitively select system prime contractors for the conduct of Demonstration/Validation. Concurrently we will initiate experiments designed to reduce program risk and resolve critical issues which include development of BM/C³ Test Bed, development of the kinetic energy ASAT Booster, full scale hypervelocity impact tests, and we will explore a proof-of-principle test of a novel ASAT concept. In fiscal year 1990 approximately \$66 million will be required for the kill vehicle and ground based booster, \$10 million for a sea-based missile variant, and \$19 million for system integration and program management.

ABILITY TO RESPOND IN-KIND TO SOVIET ASAT USE

Senator EXON. General Piotrowski and General Moorman testified that retaliating against Soviet ASAT launch sites in response to Soviet attacks on U.S. satellites is a "desperate" option (Piotrowski) and "highly escalatory" (Moorman). I am very concerned about this matter and wonder whether these views in fact represent U.S. policy. I do not believe it is in the interest of the United States to convey the im-

pression to the Soviet Union that they may be able to attack critical U.S. national assets from a "sanctuary." I do not believe that the administration should portray retaliation against launch sites as "highly escalatory" or a "desperate" action. I believe that retaliating against the source of an attack is in principle not escalatory. I think it is also clear that the United States observes this principle in other areas.

As an example, consider the views of Richard Perle, who in March of 1983 testified to the SASC as follows:

"[L]and-based air, especially the SNA Backfire, is an important element of the Soviet naval nuclear threat to our Navy. Agreeing to confine a nuclear war to the sea would in essence allow the Soviets to operate nuclear strikes against our naval forces from a sanctuary of land-based airfield, and this would undercut both deterrence and defense . . . [I]t is a fact that we and our allies are far more dependent on using the sea than are our potential adversaries. If we agree to confine a nuclear war to the sea—by, for example, tacitly agreeing to a series of tit-for-tat exchanges—we would soon lose the surface naval capabilities we depend on to defeat the naval air, surface and submarine forces attempting to sever our SLOCs. Thus a nuclear war confined to the sea, even if it resulted in the essential elimination of both the U.S. and Soviet surface fleets, would threaten our ability to reinforce our allies."

What Secretary Perle said with respect to nuclear war certainly applies with equal or greater force to conventional conflict. The principle Secretary Perle was espousing is that the source of an attack is as important as the target of an attack or the type of weapon used; the launch point of an attack, one must conclude, is fair game for retaliation.

It seems to me that this principle also was involved in our previously planned INF deployments. If the Soviets used SS-20s to attack Europe, we would have responded against Soviet territory. I believe the Soviets found that threat to be credible.

Would you explain U.S. policy with regard to whether Soviet ASAT launch sites should or should not be considered a "sanctuary" in the event of a conventional conflict, and explain the distinction, if any, between the case and the scenario of an attack by land-based aircraft against U.S. naval forces?

Ambassador WOLFOWITZ. The point Generals Piotrowski and Moorman were making was that the lack of a U.S. ASAT capability could leave us with limited military options in response to an attack on one of our satellities. In fact, past military exercises have repeatedly demonstrated that in the absence of a U.S. ASAT capability, the United States has two choices if the Soviets attack and destroy one of our satellites—do nothing or take some other military action that could be dangerously escalatory. The ability to respond to the loss of a U.S. satellite by correspondingly destroying a Soviet satellite, however, does not rule out choosing the option of responding against the ASAT launch facility. It is notable, though, that most of the Soviet terrestrial facilities—with the exception of their space support ships—are located within the Soviet Union. Therefore, an attack on these facilities would undoubtedly involve the loss of Soviet lives and could be viewed by the Soviets as an escalation of the conflict. The risks attendant with the selection of such a response would have to be weighed by the National Command Authorities. Therefore, a capability to respond in-kind to Soviet ASAT use is essential to avoid a response that would be militarily ineffective or potentially escalatory.

Senator EXON. We thank you very much for being here and being forthcoming and very helpful to us today.

We are adjourned.

[Whereupon, at 3:51 p.m., the subcommittee was adjourned.]

**DEPARTMENT OF DEFENSE AUTHORIZATION
FOR APPROPRIATIONS FOR FISCAL YEARS
1990 AND 1991**

TUESDAY, JUNE 13, 1989

**U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC FORCES
AND NUCLEAR DETERRENCE,
COMMITTEE ON ARMED SERVICES,
*Washington, DC.***

STRATEGIC BOMBER AND CRUISE MISSILE PROGRAMS

The subcommittee met in executive session, pursuant to notice, at 9:07 a.m., in room SR-222, Russell Senate Office Building, Senator J. James Exon (chairman of the subcommittee) presiding.

Committee members present: Senators Exon, Nunn, Levin, Glenn, Warner, Thurmond, Cohen, and Gorton.

Committee staff members present: Arnold L. Punaro, staff director; Andrew S. Effron, general counsel; Richard D. DeBobes, counsel; Kathryn E. Bognovitz, special assistant.

Professional staff members present: Robert G. Bell, John J. Hamre, William E. Hoehn, Jr., T. Kirk McConnell, and Michael J. McCord.

Minority staff members present: Patrick A. Tucker, minority staff director and counsel; Romie L. Brownlee, minority deputy staff director; Brian D. Dailey, Judith A. Freedman, Ronald P. Kelly, and George W. Laufer, professional staff members.

Staff assistant present: Mickie Jan Wise.

Committee members' assistants present: Jeffrey B. Subko, assistant to Senator Exon; Milton D. Beach, assistant to Senator Glenn; Leon S. Fuerth, assistant to Senator Gore; Terrence M. Lynch, assistant to Senator Shelby; James M. Bodner, assistant to Senator Cohen; Dudley L. Carlson, assistant to Senator Wilson; Anthony H. Cordesman, assistant to Senator McCain; and Robert M. Soofer, assistant to Senator Gorton.

OPENING STATEMENT OF SENATOR J. JAMES EXON, CHAIRMAN

Senator EXON. The subcommittee will please come to order.

We meet today in closed session to review a number of bomber and cruise missile programs in support of next month's markup. Our witnesses today are Mr. Jack Welch, the Air Force Assistant Secretary for Acquisition, and Lt. Gen. Ronald W. Yates, who is Mr. Welch's Military Deputy for Acquisition.

Gentlemen, welcome to both of you.

The air leg of the triad seems to have many problems. We have fielded 97 B-1Bs, but their defensive avionics systems do not work as advertised, and the DOD now wishes to invest upwards of \$1 billion in further attempts to make it work.

Some in Congress questioned whether we should continue to fund these fix-up efforts, instead, relegating the B-1 prematurely to the role of a cruise missile carrier. But there are two problems with this approach.

First, the START talks are structured in a way that penalizes cruise missiles carrying aircraft relative to penetrating bombers; second, progress in the development of our new cruise missile, the Advanced Cruise Missile, has been slow and irregular, to say the least.

Many in Congress, myself included, are nearly at the end of our patience with regard to the ACM.

Finally, there is the B-2, the Stealth bomber. It is now well over a year behind schedule for the first flight, and its overall program costs appear to be steadily rising.

I well remember that our colleague, Senator Glenn, used to round the estimates up to proclaim them at two per billion dollars. Now he does not need to round that out.

Mr. Gorbachev continues his peace offensive and the defense budgets continue to decline. I, for one, think that they will.

The B-2 may simply become the Rolls Royce of bombers. I hope not, but that is a concern. Even if it encounters no technical problems, it still might be in trouble. It may just become unaffordable, especially since lots of people have lots of worthy programs that could be funded by the \$50 billion or so yet to be spent on the B-2.

Speaking as one who has followed the B-2 programs closely, I think that would be a tragedy. This technology, this airplane, assuming that it works as advertised, is going to give the Soviets fits. Their huge investment in air defense will become basically worthless. Equally important, as I see it, every two-bit Third World dictator will have to worry about no warning surgical strikes against any target of value in his country by B-2s flying from CONUS with minimal support and using conventional weapons.

Another way to put this gentlemen, is, in the view of this Senator, the B-2 is not just another bomber. It's just not another airplane. It's a whole new capability, a leap forward, if you will, that we should not dismiss without a lot of consideration.

We would also want to discuss two other matters today. One is the SRAM II program, and the other is the use of the so-called "M" account funds by the Air Force to pay for the fixes on the B-1B avionics suite.

I am pleased to note that DOD has allowed the Air Force to discuss the results of last week's Defense Acquisition Board meeting on the B-2. So we will receive the latest details of this new schedule and cost estimate.

This committee has fought hard to keep the B-2 program on track, and this year's fight will certainly not be any easier. Information and programmatic details simply make our job that much easier.

With that, if there are no other opening statements by Senator Glenn or Senator Gorton, we will go to the witnesses.

Senator GLENN. I have no statement.

Senator GORTON. None, thank you.

Senator EXON. Senator Thurmond has a prepared statement that he wishes to be included in the hearing record.

[The prepared statement of Senator Strom Thurmond follows:]

PREPARED STATEMENT OF SENATOR STROM THURMOND

Mr. Chairman, I am happy to welcome Mr. Welch and General Yates to testify before the subcommittee on the status of our bomber and cruise missile programs. The subcommittee has supported these programs in the past because of the need to ensure that the United States continues to have the benefit of a strong and survivable deterrent triad into the 21st century. Your testimony is an important factor in our discussion and deliberation of the President's Strategic Modernization Program. I hope we will be able today to put in the record the answers to troubling questions on these programs.

As part of the Strategic Modernization Program, the Air Force is planning to spend \$20 billion on the B-1B and \$68 billion on the B-2, to replace the now near 40-year-old B-52. The subcommittee is concerned over the very serious problems with the B-1B defensive avionics and the very high cost of the B-2.

The B-1B is turning out to be a very effective airplane, and the Air Force ought to be commended for that fact. But it is an expensive airplane. Congress has placed a cost cap of \$20.5 billion on the program, and we understand that the Air Force has done a "Global Restructuring" of the defensive avionics program to meet this cap. We hope you can tell us how you have limited the Government's liability and how the deficiencies in performance will be remedied. In particular we hope you will explain to us why you believe it is appropriate to use the so-called "M-1" account of unobligated funds from former fiscal years.

We understand that the B-2 will soon have its first flight. We have come to expect great things from this airplane, and we are clearly going to rely on its ability to penetrate well into the next century. Although some have tried to call the B-2 a destabilizing first strike weapon, this is very misguided and very wrong. My worries about the B-2 are about quality control and cost.

Mr. Welch and General Yates, we welcome you to help the subcommittee come to grips with these problems. Thank you, Mr. Chairman.

Senator EXON. Gentlemen, I welcome you once again. I presume that we are going to proceed with you, Mr. Welch.

But before we do that, I would ask the staff to advise the Chair whether or not the room has been properly cleared.

I have been asked to read this statement to all who are present.

Ladies and gentlemen, today we are participating in the very first non-Special Access Congressional hearing on the B-2 Advanced Technology Bomber and the Advanced Cruise Missile. This is an important step in the security transition of the B-2 and the ACM program in that members and staff who not heretofore had the opportunity are in attendance here today.

However, let me caution you that, while the briefing itself is classified at the Secret level, we who have previous knowledge of the SAR materials must be careful to not include SAR information in the phrasing of our comments or our questions.

With that, the Chair welcomes and is pleased to recognize you, Mr. Welch. Thank you for being here.

STATEMENT OF HON. JOHN J. WELCH, JR., ASSISTANT SECRETARY OF THE AIR FORCE FOR ACQUISITION, ACCOMPANIED BY LT. GEN. RONALD W. YATES, JR., USAF, MILITARY DEPUTY TO THE ASSISTANT SECRETARY OF THE AIR FORCE FOR ACQUISITION

Mr. WELCH. Mr. Chairman, thank you very much. General Yates and I are pleased to be here this morning.

The B-2 is the first subject on the agenda. I think the most appropriate way to approach this is each of you, hopefully, has been

given a series of charts which will make it a little easier for you to try to look through the charts. I can give you a quick update on where the program is.

I will give you a background with each one of the charts on the schedule, and the history and risk, and then we can proceed to questions on that subject.

OVERVIEW

- **SYSTEM DESCRIPTION**
- **FUNDING**
- **SCHEDULE**
- **SUMMARY**

3

If I could ask you, really, to go to chart 3, I will just talk a little bit about the system description to bring people up to date. Then we'll look at the funding and the schedule.

B-2 CHARACTERISTICS

- LARGE NUCLEAR OR CONVENTIONAL PAYLOAD

- PENETRATION SPEED: HIGH SUBSONIC

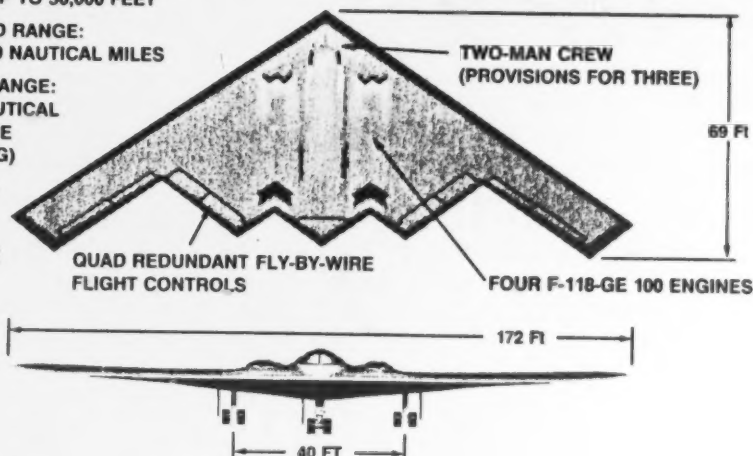
- ALTITUDE: UP TO 50,000 FEET

- UNREFUELED RANGE:
– OVER 6000 NAUTICAL MILES

- REFUELED RANGE:
– 10,000 NAUTICAL
MILES (ONE
REFUELING)

- HIGHLY SUP-
PORTABLE
AND
DEPLOYABLE

ALL FEATURES DESIGNED TO MINIMIZE
OBSERVABLE RADAR, INFRARED, VISUAL
AND ACOUSTIC SIGNATURES



4

On chart 4, I think that certainly the people present here today have seen what the airplane looks like. I think the key to this chart is that the characteristics of the airplane, since the time that we made significant changes to the wing in the 1983-1984 time period, was essentially unchanged.

The performance that we expect from the airplane is unchanged from what you have heard in earlier years. That performance includes the supportability aspects and other things.

So, I think the single message from the B-2 characteristics chart is simply that we are proceeding and expect to get that performance which we started out with to meet the requirements.

[Chart 5 deleted.]

On chart 5, perhaps the most significant chart, you see the results from the various reviews that have gone on with it to support the amended budget.

I have to say that there is some final review yet to be done on these numbers, and we do owe the Congress some reports with respect to acquisition strategy and all, and I will speak to those a bit later.

I think it is also important to say where we are in the program as these numbers are developed.

It comes as no secret to this committee that we have not yet flown air vehicle number one. We have completed only one air vehicle.

So, in terms of the actual data from which to build these estimates, we would certainly like to have much more than we have right now. But we, like you, recognize the necessity to be able to present to this committee the numbers that are included in the

budget, the technical and programmatic risks that went into their development, and the levels of confidence in these numbers.

I think it important to state that no one can guarantee the new number in then-year dollars of \$70.2 billion as the program cost. What it does represent, though, is the use of sound estimating technologies based upon the actual hours that it's in the first air vehicle, built up by the program office, and then reviewed by independent cost estimates and the Cost Analysis Improvement Group, both within the Air Force and within the Department of Defense.

As Mr. Cheney said previously as he reviewed the budget, he had several questions in his mind with respect to financial information and with respect to programmatic.

He, along with Mr. Atwood, the Deputy Secretary, and Dr. Rice, the Secretary of the Air Force, and several others, have now visited the Pico Rivera Manufacturing Plant and the Palmdale assembly facility. I believe that they have satisfied themselves as to the scope of the program and as to the risk of the program.

I am sure they will tell you themselves that they would wish that we had more actual information at this time, as I said, such as flight test data or more air vehicles.

We have six air vehicles in various stages of production right now involved in finishing out the full-scale development vehicles and the start of the low rate initial production.

Senator EXON. Did you say six, Jack?

Mr. WELCH. There are six full-scale development articles that will fly, plus two in the full-scale development program, one a durability and one a static test. So in the full-scale development program, we have six fliers and two for ground tests, and then we are starting with 1987, 1988, and 1989 money which I'll speak to, a low rate initial production program.

Senator EXON. If I remember right, Jack, we've got this one airplane that is supposed to finally fly, sometime, maybe it's days or weeks. Then we've got two more, I believe, that are pretty well along. The rest of them are further back in the construction cycle.

Is that correct?

Mr. WELCH. The first six come along in a pretty significant series, and then there's a bit of a break on the low rate initial production. [Deleted.]

Senator EXON. So that would be the first flight of the operational aircraft that we envision?

Mr. WELCH. [Deleted.]

Senator EXON. Now, tell me this. I was a little bit more concerned at the statements you just made about expecting the first aircraft to be flown sometime in this calendar year.

You aren't telling me that we should anticipate another 6 or 8 months' delay, are you?

Mr. WELCH. No, sir.

[Deleted.] The number one air vehicle is, we believe, certainly within the next 30 days, and, hopefully, the early part of July. We are getting very, very close.

Senator EXON. Thank you.

Go ahead.

Mr. WELCH. I think in the review that has gone on since the original budget submission in January, it has done several things. I

think they are best captured on chart 5. We have tried to put on chart 5 sort of the "is/was," so you can see the various things that have happened.

In the simplest sense, we have delayed the program 1 year, based upon an assessment of risk to go, the fact that we have not flown yet, and, over the course of the 5-year plan that we're looking at right now, we would be reducing the dollars within that FYDP a little over \$4 billion.

You can see that in the right hand column.

We would be reducing the number of aircraft that are purchased during this 5-year period by about 28, [deleted].

Senator EXON. With [deleted] what?

Mr. WELCH. [Deleted.]

So, what I'm trying to illustrate by these numbers is that we have, I believe, appropriately slowed the airplane down to get more factual data, and we have also reduced the ramp of buildup in production to make it a less concurrent test program.

Senator GLENN. Mr. Chairman, may I ask a question here?

Senator EXON. Go ahead.

Senator GLENN. My understanding is—how many would be delivered at the end of the 5-year period?

Mr. WELCH. [Deleted.]

Senator GLENN. And the total cost, is it—oh, I see. There it is, down across the bottom.

Then the total cost would be what, \$70.2 billion at that point?

Mr. WELCH. No, sir.

The \$70.2 billion is the total then-year cost, after 132 aircraft.

Senator GLENN. OK.

Senator EXON. Wait a minute. Would you say that again.

Mr. WELCH. The total program cost in then-year dollars is \$70.2 billion.

Senator EXON. For how many aircraft?

Mr. WELCH. That is the full 132 aircraft.

Senator EXON. For the 132. I see.

So, we aren't going to have that many aircraft. But at the end of fiscal year 1994, we will have spent \$13.8 billion. Is that right?

Mr. WELCH. At the end of fiscal year 1994—I'm going to have to add these numbers up.

Senator EXON. You will have spent \$49.4 billion?

Mr. WELCH. Something like that.

Senator EXON. And the last part of that \$49.4 billion is \$13.7 billion in fiscal year 1994?

Mr. WELCH. In the too complete time periods.

Senator EXON. Oh, I see, the too complete time periods.

Mr. WELCH. So the way I read that chart is through fiscal year 1989. You have committed \$22.4 billion. During the FYDP period you will commit I believe just under \$40 billion; and then there are \$13.8 billion to go, outside of the present FYDP time period, giving a total program cost in real-year dollars of \$70.2 billion.

Senator EXON. For 100?

Mr. WELCH. For all 132 aircraft.

Senator EXON. But you started out by saying that it's an "iffy" figure. I believe you said earlier that no one can say what it will be.

Mr. WELCH. Well, in the first place, nobody can obviously guarantee that.

I can tell you that on that figure we have what is called a "grass roots estimate," which has been built up from all of the elements of the program. It then has been subjected to all of the parametric analysis that goes on, on comparative pricing, comparing things to previous aircraft programs, where you might want to say that a rule of reason has been applied throughout all of our history.

So, what we would call that right now is comparable to any previous estimate, I think, in terms of review, and probably significantly more review than most.

Now, I don't want to confuse things here a bit, but I do have to talk in base-year dollars for a moment.

I believe that we have progressed through three numbers now in the past year in measuring this program. You will recall that a year ago we were at \$36.6 billion for the total program in fiscal year 1981 dollars, which is how we do our comparison. In December of last year, we released a number on the program of \$42.5 billion. With the schedule delay here now, that \$42.5 billion is \$43.8 billion.

So, that will give you a cost track in constant year dollars of what the program is.

The difference from last year to this year of \$42.5 billion is simply the change in schedule.

Senator GLENN. Jim, may I ask a question.

Senator EXON. Go ahead.

Senator GLENN. Is this \$70.2 billion that you have out here, all of these figures here, are these all in 1981 dollars?

Mr. WELCH. No, sir.

The figures that I have given you there are all in then-year dollars, using the established inflation rate. But the \$70.2 billion would be the equivalent of \$43.8 billion in base-year dollars.

So you can see the difference as the spend-out rate goes.

Senator GLENN. The \$70.2 billion figure is in each of the next 5 years with an inflation rate?

Mr. WELCH. Yes.

In fact, we don't deliver out till essentially the end of the decade. So it takes into account the inflation of the whole decade of the 1990s in the year that it occurred.

[Chart 6 deleted.]

I think if you would turn to chart 6, you could get a better picture of how the program has been adjusted.

Senator EXON. Excuse me, Jack. What chart are you on now?

Mr. WELCH. I'm on chart 6.

I was just going to illustrate the schedule change that I spoke to a moment ago.

You can see in what has been labeled the Bush budget there that the start of production deliveries and the rate of buildup of those deliveries is slowed quite dramatically. [Deleted.]

Senator EXON. Maybe this is not the place to ask that question, but I'm sure it's on the minds of all of us.

Could you or the General give us any estimates or did you consider during the development of this outlay what would happen if we would decide somewhere along on the program to build 100, in-

stead of 132, or to cut them in half and maybe end up with a fleet of 60 to 70.

Did you do any calculations on that kind of eventuality and how much lesser the costs would be?

Mr. WELCH. Let me answer your question a little bit differently.

What we said was let us look at this profile and see what the caveats are in it that makes it achievable. We can talk to those. I tried to put them in in a later chart.

They really go as follows.

[Deleted.]

The multi-year program is planned in fiscal year 1993, which is about the very end of the flight test program. We have presumed savings in the multi-year program.

We have also rephased the program to take advantage of better manpower rates in all.

[Deleted] on top of the \$70.2 billion.

[Deleted.]

We should be in a position to deliver, as I say, some of the congressionally requested reports this week, over to here, and it details the buildup.

But, specifically, we have not tried to look at options that change rates——

Senator EXON. Or cut back the numbers?

Mr. WELCH [continuing]. Or cut back the numbers, because we have basically sized our program to meet the requirement.

So we have been trying to establish confidence in schedule and technical risk, and the proper buildup in the early year funding, particularly in this FYDP, for managing that risk, in terms of cost and schedule.

Senator EXON. Thank you.

We apologize for interrupting you, Jack. Go ahead.

Mr. WELCH. Oh, not at all. This is just fine. Thank you.

[Chart 7 deleted.]

If we go to chart 7, here you will see the schedule that we are proceeding on. I would point out and remind you that I know this committee recalls that prior to the time period of late 1987 and into 1988, we were on what we would call a schedule driven program; that is, we were holding the calendar of events fixed and trying to make work-around plans to make those dates.

In the 1988 and 1989 time period, we are now in what's called a milestone-driven schedule; that is, we must accomplish certain testing and certain other elements before we can go on to the next phase.

I believe that that's the best way to address the first flight of air vehicle one.

We have not found in that air vehicle any technological surprises. What we have found in the application of these new technologies is that some things are different than we expected; other things which we expected are taking more time to fix.

So, we are adjusting our schedule to fit the accomplishments that we have.

In fiscal year 1990, we have scheduled another major DAB review that will, in fact, review the program again to the depth that is just being completed before the fiscal year 1990, which

would then give us the opportunity to look at about six, vice one air vehicle completion. So we will have actual hours of learning.

[Deleted.]

We have delivered to the Congress what's called a maturity matrix. During each year starting with fiscal year 1991, a significant series of events must be completed. Each item is listed and how it will be demonstrated.

So, from this point forward, one can look ahead. It will be simply a matter of stepping through. Either we have completed these tasks or we have not.

The maturity matrix was delivered with last year's budget detail to the Congress.

So we believe that the flight test schedule that we have shown here has reduced concurrency. You will recall a year ago we increased the number of calendar months a little bit on the flight test program; from 44 to 49 months and the number of aircraft in the flight test program went from four to six.

So, we really believe that we have addressed the concurrency issue and the depth of test issue that was asked with this new schedule.

We will also effectively be finished with our OT&E program and have that well behind us at the time that we reach the initial operational capability.

So, we have, in addition, provided in these numbers that you see here what we would consider a prudent number of dollars for engineering change proposals, for correction of defects, and for management risk.

We have included in here on the order of \$3 billion. This is as compared to the other bomber programs we have gone through and also some of our more recent fighter aircraft, consistent, with respect to the amount of change orders that we would expect during the flight test program.

Senator GLENN. May I ask how did you arrive at those figures? Did you take past programs and put a slippage figure on?

Mr. WELCH. Sir, right now, the number for engineering change orders seems to be about 6 percent if we do a regression analysis back over our other programs. That's applied to the full-scale development dollars and the production dollars.

As far as risk is concerned, there is always a difference between, frankly, what the Government estimate is vice what the contractor estimate is, which provides some opportunity to recognize the specific contractor performance.

So we will be different there. That provides for management risk.

Senator GLENN. If I may ask another question, did I understand you to say that you put in a money pad in here to take care of uncertainties?

Mr. WELCH. Well, sir, it's not a money pad.

Senator GLENN. It's not a money pad? Just time?

Mr. WELCH. What we have said is that as we evaluate the numbers that we have, we use history in a regression analysis to determine the number that we would expect and should provide. The number is 6 percent for engineering change orders, and we should provide in excess of that 6 percent when funding for risk with re-

spect to schedule performance. There is a third area, which is correction of deficiencies, which are contractor responsibility items, that show up in the share line of an incentive contract.

Each one of those things has been addressed separately.

Senator GLENN. Mr. Chairman, this is the highest figure I have seen yet. I am glad we are getting these figures in out-year dollars. I have just divided that out, and that is \$531 million per aircraft—if you take the total and divide it by your \$70.2 billion. Is that correct? Some of this is in out-year dollars. It's in inflation. I realize that. But if you take the \$70.2 billion and divide by 132, it comes out to \$531 million per aircraft over the total life of the project.

Mr. WELCH. The total cost of the program, yes, sir. The \$532 million number produces a fly-away cost in then-year dollars of \$315 million per aircraft.

Senator GLENN. Wait a minute. I didn't follow you there.

Mr. WELCH. I'm just saying that total cost includes all the nonrecurring and everything else, the support equipment and all.

Senator GLENN. Yes, OK.

Mr. WELCH. The fly-away cost of the individual airplane. More importantly than that, I think it also has to be looked at with respect to where we are in the program in terms of being spent. So, looking at the cost per aircraft in the "to-go," column, the majority of the program cost in the to-go column is the production portion of the program.

Senator NUNN. What is the per unit cost of the aircraft from this point forward assuming that we've spent \$22 billion, is that right?

Mr. WELCH. Yes, sir.

We have appropriated that much.

Senator NUNN. So \$22 billion has been spent. If you look at the number of aircraft now and how much we're going to have to spend from this point forward to get them, what is the unit cost?

Mr. WELCH. We'll have to get that number, Senator Nunn, for the record as we are calculating the number.

Are you wanting to include the costs of the remaining RDT&E—

Senator NUNN. Right.

Mr. WELCH [continuing]. And the production costs. So you'd like unit costs to-go?

Senator NUNN. Unit costs to-go.

I want all of the cost items. I want the ones Senator Glenn mentioned and the unit costs to-go.

[The information follows:]

B-2 Cost

B-2 total program cost is \$70.2 billion (\$20.8 billion for RDT&E and \$49.4 billion for production). As for RDT&E, \$15.4 billion of the \$20.8 billion has been appropriated, leaving \$5.4 billion. As for procurement, \$7.1 billion of the \$49.4 billion has been appropriated, leaving \$42.3 billion for procurement of 116 B-2s.

FLY-AWAY COST

Senator NUNN. Then could you define "fly-away" for me again? I have heard that for 20 years, and every time I hear it, it seems like it has a different twist on it.

What's your definition of "fly-away costs?"

Mr. WELCH. Fly-away cost is production cost of the aircraft. It is the recurring production costs of the airplane, not including the write-off of the investment or RDT&E.

Senator EXON. If I could clarify that, that's a good question, Senator. Let me see if I understand it.

There's 132. What did you say, were there 312—what was it? What are the fly-away costs?

Mr. WELCH. The fly-away cost of the airplane is \$315 million.

Senator EXON. It's what?

Mr. WELCH. It's \$315 million per aircraft.

Senator EXON. All right. It's \$315 million.

What that means, then, if I understand it, is that the last, the 132nd aircraft that we fly away will cost \$315 billion just for that aircraft, which does not—

Senator NUNN. No, million, please. [Laughter.]

Senator EXON. Yes, I'm sorry. Of course, million. This does not include all of the research and development previously. Is that what you're saying?

Mr. WELCH. But that's an average.

The last B-2, in other words, the effective 127th production aircraft, will cost \$244 million. The last airplane off the line.

Senator GLENN. Is the answer to Sam's question this? If you take the \$22 billion, what we've spent up to now, and take it off the \$70.2 billion, that takes it down to \$48.2 billion, and you'd divide it by 132, which is where we are, and that would be \$365 million per copy from here out.

Senator NUNN. So it's \$365 million.

Senator GLENN. It's \$365 million from here out, with everything spent to now.

Well, you follow my figuring, don't you?

Senator NUNN. I've got you. Yes.

Mr. WELCH. We just calculated \$363 million.

Senator NUNN. I would like to find out, once again, what you define as "fly-away" costs. I get many different explanations.

Mr. WELCH. Let me do that for you.

The total fly-away cost is the engineering support for the production airplanes, some write-off on the retooling that is put to each airplane; then the actual manufacturing costs of the airplane, the quality control, D&A and profit of the contractor, engineering changes on a percentage basis applied to each aircraft, including the Government furnished equipment. Then there is some aspect of production facilities that gets in there on a percentage basis. Then you finally have to overlay the warranty fees per airplane, and then the system test and evaluation of that aircraft, and then a percentage of program management.

So there is a very long list of things that go in.

Senator NUNN. What's not included then? That might help us just as much as anything. What's left out?

Mr. WELCH. If you want to go to what's called procurement costs, you then have to add in some more spares, modification program, the support equipment for the program, data, training, operational site activation, and then, finally, you go to a category that the budget people call total acquisition cost, at which time now you add in the total research and development cost and the Milcon.

So, those are the three categories that we report costs to.

Senator NUNN. So you've got fly-away costs in one category. What are the other two?

Mr. WELCH. There are procurement costs.

Senator NUNN. That's everything divided by the number of units. Is that right?

Mr. WELCH. No, sir.

That's everything except milcon and RDT&E, and total acquisition costs.

Senator NUNN. OK.

So total acquisition cost is there.

Senator GLENN. So let me correct the figures here.

We've already got eight aircraft that we paid for up to now. So that means that if you take off the \$20.2 billion, it leaves you \$48.2 billion; and you have 124 airplanes into that. That comes out to \$387 million, and that assumes no problems.

So it would be \$387 million per copy from here on?

Mr. WELCH. With the exception of assuming no problems, that's correct.

What it assumes is that we will have the same level of change orders, risks, et cetera, as we have seen in our current airplanes.

So if you want to look at a number there, the best we could identify it is it's somewhere in excess of \$3 billion that we have provided for problems.

FLIGHT TEST PROGRAM COST

Senator GLENN. Do you have a figure for the test program itself?

Mr. WELCH. No, sir, I don't.

Do you mean the full-scale development or the flight test?

Senator GLENN. Well, the flight test program that takes it out and either proves or disproves all of the wind tunnel data and everything else.

I don't think anyone wants to stop, or at least I don't. I certainly don't have any question about continuing and running out the test program to find out where we stand with all of this new technology. But there are a lot of questions obviously in the press, and our questions today indicate concern about how far we want to go with the production at this point, with this expense.

Mr. WELCH. The full-scale development program, which includes the six flight test aircraft and the two static and durability airplanes and tests is \$20.847 billion.

Senator GLENN. It's \$20.847 billion, and that includes all of the testing of the whole program costs, not just the airframe costs?

Mr. WELCH. What is also presumed, though, is that we have the program phasing that we have right now. If you took away all the manufacturing and other activities, you know, it would have to flow back.

So that number has simply a fair share of all the management that's present. But the number that's in the \$70 billion program here is \$21 billion for full-scale development.

Senator EXON. But that does not include such things as, we're going to have more expense than that, training of the crews and all of that, right?

Mr. WELCH. That provides, in that program you get some data elements and all of that type of thing, to include the training elements, getting the data in place and the training elements. It also includes the development of simulators for crew training.

But all of that necessary material that must be developed at one time that would be turned into handbooks and special support equipment starts in the full-scale development program. Its recurring costs per base then are funded over in the other accounts.

Senator EXON. Jack, have you finished, or do you want to go ahead?

STATUS OF CONGRESSIONALLY DIRECTED REPORTS

- TOTAL PROGRAM COST REPORT
- FY89 COST RISK CERTIFICATION
- COST TRACKING SYSTEM REPORT
- ACQUISITION STRATEGY REVISION

8

Mr. WELCH. Sir, I think the one thing that I would like to say on chart 8 is that we recognize that there are four reports that have been requested by the Congress this year that have been delayed because of this review. Each of those four I would anticipate would be available within days, hopefully this week. They detail the material that we are presenting here for the first time.

Senator EXON. It will be helpful. We will be awaiting those, as we have been.

Mr. WELCH. Yes, sir.

In summary, I would really say that I think we have all said what we believe the B-2 can do. We believe that the full-scale development progress is good. We believe we have closed the major technological risks. We are very close to a first flight. But I would have to caution, again, that this is based on one air vehicle completion and not flying yet.

At the same time, as we compare it to previous programs that have been scheduled and, in fact, costed out from that data base, in

both the parametrics as well as regression aspects, we would tell you that this is a prudent and reasonable program.

We do need support in some specific actions on this program. We do need to recognize saving the fixed price option contracts. [Deleted.] We will be sending that over in the report.

We are rephrasing the program, as you might imagine, and we're having to move, or could expect some money to move, from later years to earlier years in the 1987 and 1988 time period, and that's on the order of \$300 million. That is simply a phasing.

All of those costs have been included in the \$70.2 billion number.

Then there are a couple of other items that we will need specific help on since we have changed the schedule here, and we obviously will need it fairly promptly, since we have come so late into the year.

Most of them are simply technical adjustments to permit us to do things which we have, in fact, already funded.

That is the completion of the discussion on the B-2 program.

Senator EXON. Jack, have the figures that you have given us been signed off by the Office of Management and Budget? Does everybody agree on this, or is this just the Department of Defense?

Mr. WELCH. First let me say that I believe we're within a day or so of having all the signatures on the paper. But the position that I have shown today is the Department of Defense presentation.

As you recall, I think Secretary Cheney said he would come back and deliver these.

Senator EXON. And this is it?

Mr. WELCH. He has not totally finished yet. But I believe you should have confidence that these are the numbers he will come and talk to.

He may have more specific address to how he sees the risk as a result of his personal address to the program, with Mr. Atwood and Dr. Rice. But I would not expect to see either the schedule or the dollars or the spread of dollars change.

Senator EXON. Thank you, Jack.

General, do you have anything to add to the B-2 presentation that we have just had from Mr. Welch?

General YATES. No, sir.

Senator EXON. Let me ask you this question.

132 AIRCRAFT

Why 132? Can you give me something that a layman can understand?

How did you decide on 132 aircraft?

General YATES. It starts with the target set to be covered. [Deleted.]

So those targets are left for the bomber force. [Deleted.]

So, fundamentally, that is how you come up with the calculation.

Senator EXON. I guess I don't quite understand, though, how you do come up with them. If we had 50, instead of 132, that would not be significantly different from a deterrent standpoint, would it?

In other words, it seems to me if we have a substantial force of these bombers, it confounds the Soviet planner tremendously, does it not?

Isn't that the secret of this weapon system?

General YATES. That's true, Senator. But the point would be that while even a few confound his planning, you have to make some judgment as to how many it would take, beyond just perplexing him, to, in fact, deter him.

Our view is that of the total targets we think we need to cover to assure deterrence—that's not the total target, sir; we don't cover all the targets. But to assure deterrence, to cover the B-2's share of those in the out-years we think takes about 130 airplanes.

Senator EXON. Mr. Welch, can you briefly explain what is the reason for the delay of the initial flight. I have been told that in our development and production and moving to flight test of the first airplane, we have taken a much more cautious route than we have on any bomber program that we have previously undertaken. In other words, supposedly when this airplane flies, on its first test flight it will be much further along than was the B-1, for example, when we first flight tested it.

Is that accurate?

Mr. WELCH. Sir, I would make a couple of comments.

If you are referring to the B-1B, having previously had the B-1A flight test behind it, obviously it would not be the same.

But with respect to the B-1, they are very hard to compare.

The B-1 really applied the technologies of the sixties. I think we had a lot of data base, a lot of understanding, and a lot of simulation and that kind of activity.

Here, at each step of the process we have wanted to make sure that we have done all of the testing of the subsystems in the B-2 and the applications of the new technology, everything we can do on the ground before we fly.

So, rather than super cautious, I would simply say we're prudent. We set some rules in place for ourselves some number of years ago with respect to qualification of the hardware before we flew.

We have a flight control laboratory, where we actually cycle the hardware through and run it on sort of an iron bird, if you've been out there, and see it tied into computer controls. And we've got flight justification testing on all of those.

Now I need to be a little careful here. There are several other things that are different in this program, and we have tried to make sure that we have no items that occur that we don't close out.

As I say, if there are two things—caution, certainly—but I think the two things that we speak to most is that because of the configuration, et cetera, of the airplane, we were probably a little over-optimistic to the work that could be done in a unit period of time—let me put it that way.

The second one is that when we have run into a test anomaly, which is normal in these programs, I think we have stopped and closed that out because we don't have a previous data base.

So I don't think we've been overly cautious. I would say we've been prudent.

I guess if I could give a little bit of a commercial here, having a number of B-1s available, standing alert, et cetera, allows us to pace our schedule a little bit here. We don't have to be driven into

schedule kinds of things. We have an opportunity here to do what I think we have been asked to do, again, which is to make sure we have achieved the things required before we go on to the next one.

Senator Exon. My time is up.

I'll just say that I was very interested in what the Secretary had to say about this program. After his previous statements were I think somewhat misunderstood, or there was a lack of emphasis put on them, when he said he was going to review the program, I think a lot of people thought well, he's reviewing it, and maybe in terms of inflation or cancelling it. That's not the case.

I talked to Department officials other than you, two. It was said to me the other day by one of the key players that both he and the Secretary were very impressed with what they saw on a recent visit.

Senator Glenn.

Senator GLENN. Thank you, Mr. Chairman.

Let me comment first.

I have been somewhat amazed over the last month or so at the amount of material now being put out officially on the B-2. It looks like some questions started being asked and it looked like the program might be in some danger, and all at once the security requirements have gone down, too.

General Randolph is now discussing things quite openly, discussing adverse yaw problems, control problems, and all sorts of things that are now in the public print that were only on a very limited access basis here about 60 days ago.

I don't know. With such a relaxation in security restrictions, there is very little that remains classified now.

There are some things that we have been very concerned about, such as adverse yaw and roll rates and things like that, which we have asked questions about through the years. I could not get any answers on them, and now they are being openly discussed with reporters and everybody else.

That's just a comment.

At any rate, let me get into something else here.

There have been 11 production aircraft approved, is that correct?

Mr. WELCH. Let me make sure of my numbers.

Through fiscal year 1989, there would be eight approved. There are three additional in fiscal year 1990.

So, with the fiscal year 1990 budget, there would be 11 low rate initial production aircraft.

Senator GLENN. Yes

Mr. Cheney recently deferred the fiscal year 1990 procurement of the T-45, which is a training aircraft, because of problems discovered in tests, and the SH-60F, the ASW helicopters, to "correct deficiencies discovered during operational flight testing."

Mr. Kring's organization also recently recommended limited initial production of even the C-17 until flight testing has begun and empirical flight test results, to use his words, are available on which to base production decisions.

Now, without having flown the B-2, what operational test criteria did you use on which to base a production decision for those 11 aircraft?

Mr. WELCH. Well, I think you probably know better than we do that without flying data, it is very difficult, in terms of operational assessment. But the operational test and evaluation people have been in this program since day one. With respect to the laboratory demonstration work, the buildup before first flight, and then as we follow along, they have a set of criteria that must be met in order for it to satisfy the requirement that's laid down by SAC.

So the only answer that I can give you to your specific question is they have been involved, as has Mr. Kring's people, throughout this program, and they say the test program that is in place is adequate to test, to meet the operational requirements.

Senator GLENN. Yes, but I'm talking about the production buys.

Let me ask this.

Has the final configuration of the production B-2s been established at this point?

The final production configuration is what I mean.

Mr. WELCH. You will never have a final production configuration, obviously, until you finish the test. But I believe that roughly the number 12 aircraft is the aircraft that we would do all of the measurements if that's your question.

But in the sense of final production performance required as having been established—

Senator GLENN. Well, the final production configuration, though, is what—is it what you said a moment ago? Does that mean that final production configuration will be established on the 12th airplane, and all thereafter?

Mr. WELCH. No. It will be measured, beginning to measure those things on the 12th aircraft. The final production configuration, with respect to performance, short of changes, et cetera, will be started with the number three full-scale development vehicle, and then we'll move along through the flight test program.

The operational test and evaluation is due to be completed in the 1993 kind of time period, about the same time that we would be wanting to go to a higher rate, which is the multi-year, which is 1993.

Senator GLENN. Have we ever had an airplane that we've bought in modern times, that you're aware of, in any of the services, where we've gone to this kind of production before even the first flight, before we've even had the first flight of an airplane?

Mr. WELCH. I will have to get that for the record. I do not believe that this is a single case, though, Senator Glenn.

[The information follows:]

B-2

Yes, the highly successful F-117A had a very concurrent program, even more so than the B-2. But to focus only on the production run in relationship to the first flight ignores an important aspect of the B-2 program. All B-2 aircraft, including FSD, are being built on production tooling—tooling which will be used to build all the production aircraft. This manufacturing philosophy is unique to the B-2, helps ensure a stable airframe design, and minimizes the near-term concurrency risks. For the long-term concurrency risks, the B-2 represents nothing new.

The B-1 was a highly concurrent program structured to produce the most capability at the lowest cost in a program where the risk was considered low to moderate in most areas. Approximately 50 percent of the B-1 flight test program was completed when the production quantities were funded at 100 percent.

In contrast, the technological challenges of the B-2 have been well understood from the outset. With the adjustment in the schedule that resulted from the slip of first flight, much more flight test activity will be completed prior to the commitment of large numbers of production aircraft. By the time flight testing is 50 percent complete, less than 20 percent of the production aircraft will be on contrast.

Senator GLENN. I'm very, very concerned. We're into areas of new technology and control systems and all, as you are aware.

AREAS OF FLIGHT CONTROL

How many areas of flight control, for instance, right now are you going to have to give waivers on, do you know? What would be the normal roll rates and all the different things like that? How many waivers are you going to have to grant on the airplane from normal specifications?

Mr. WELCH. For delivery?

Senator GLENN. Yes.

Mr. WELCH. Obviously the answer is that we don't know.

Right now, as far as the hardware that is concerned, we'll be going into the low and high speed action tests and trying to see that.

But as far as the flight control hardware that's going through and the air data system and all that supports that activity, we are meeting specification right now.

Senator GLENN. Will we meet normal specs on roll rates on the airplane?

Mr. WELCH. Until we fly, yes, sir, in the sense that we have done everything that we can do on the ground, and we would anticipate meeting the required roll rate.

Senator GLENN. You have not gone to a lower roll rate? You have not approved a lower roll rate for this airplane overall that the final aircraft will fly, compared to regular Air Force specs that you would apply to any other airplane, such as the B-52, the B-1, or anything else? Is that right?

Mr. WELCH. Not that I am aware of. We are using standard flying qualities and performance specifications. I would have to check that for the record, sir.

It's the same roll rate as for the B-1, they tell me.

Senator GLENN. The same roll rate.

Mr. WELCH. You know, I think it is important to recognize that we are going to have 4 years of low rate initial production, and that the production decision on this airplane is not made really until some time well into 1991.

So we will have had these 11 aircraft spread over a period from 1987, 1988, 1989, and 1990.

So, what we have done is to get our full-scale development program and flatten that significantly.

Senator GLENN. My time is up, just about. One more question. Is this airplane going to have a coupled ILS?

Mr. WELCH. Yes, sir.

Senator GLENN. [Deleted.]

I was dismayed after the B-1 crash at Ellsworth to find out that we didn't even have a precision approach capability.

Mr. WELCH. I think we are getting into an area that we can't talk about here.

Senator GLENN. Oh, is this something that we cannot talk about here?

Mr. HOEHN. Yes, sir.

Senator EXON. Thank you, Senator Glenn.

Senator Thurmond.

Senator THURMOND. Thank you, Mr. Chairman.

FAULTS WITH QUALITY CONTROL IN THE B-2 PROGRAM

Mr. Welch, what can you tell us about the reports that former Under Secretary Costello found fault with quality control in the B-2 program?

Mr. WELCH. Well, since I have not talked to Secretary Costello since he left, I cannot really address myself to those.

I accompanied Dr. Costello to each of these contractors in August of last year, and certainly the comments that he had at the end of the trip were quite different than what I have seen recently.

I think on the most recent visit, when Mr. Cheney, Mr. Atwood, Dr. Rice and others went out, I think their impression was that there was a quality program in place, due to the kind of learning that they were seeing, the actual specific quality of the products going out, and the morale and aspects of the people, these were all good.

I think we are not satisfied with the total management performance of the contractors, and they have made some changes and are making some more changes. But with respect to quality, I think everyone was, frankly, quite satisfied that for this stage of the program, we probably have higher quality standards presently in force than we have ever had in a research and development program.

I could only speculate beyond that.

I would like to comment also as I did not really address myself to Senator Glenn's question on security.

We have been trying in a very disciplined fashion since we rolled the airplane out and people can see it to take those things which you can derive—and obviously with a tailless airplane, you can derive the idea that you might have a little bit of a yaw problem—and talk more of those.

When we delivered the fiscal year budget this year, we delivered the B-2 budget and ACM, unclassified, in the year of its choice.

We are in the process now of trying to take more and more items out as they become apparent to the public, just because we're testing. And also, security is a cost, if it's not required.

So, as we can declassify some of these things and move them down, we can get into a cost avoidance kind of situation.

The budget that will be formally delivered over with respect to this amended budget will, in fact, be in an unclassified format. We are working now also to take some of the schedules down.

Now, as hard as we are looking in that area so that we can share information, so people can look for themselves, we have identified those things that we have worked very hard to achieve and that are identified as the value items, which is some of the new technology and process areas.

We are making no movement in those areas, nor do we intend to in the near term.

Senator THURMOND. Mr. Welch, recently the Congressional Research Service published a report that I believe the chairman has considerable errors and half-truths in it.

Would you care to put on the record your views of this report?

Mr. WELCH. Well, I have not had the opportunity to read it. But in talking with people, I think we agree that there are significant errors in there. It was, I would guess, a little constrained to that which is available in the open literature, which then also causes the opportunity for some.

But I would speculate that there is an out of context problem. But we would be happy to address that, sir, if you would like.

CONTRACTORS QUALITY MANAGEMENT PROGRAMS

Senator THURMOND. Mr. Welch, do all of the contractors have mature total quality manufacturing programs, and should they?

Mr. WELCH. To answer your question, they all have total quality management programs. But "mature," if you look at the people who have put those systems in place, the maturity cycle is probably on the order of 3 to 7 years.

So I would say as of roughly a year ago, the necessary ingredients for a TOM type of program is present in each of the major subcontractors.

The best I can tell from the reports is they would say that LTV had started probably some number of years ago and had progressed the furthest; Northrop probably started the latest and was on a fairly good rate of learning and installation; Boeing had started somewhat earlier than Northrop, but probably had not progressed as far.

So, the system is in place. The maturity is yet to come.

ACM TESTING

Senator THURMOND. Mr. Welch, testing air launched cruise missiles from the B-2 has certain START implications.

What are your plans for testing the ACM from the B-2?

Mr. WELCH. None that I am aware of.

There are none.

Senator THURMOND. General Yates, many people are throwing around numbers on the cost for the B-2—fly-away costs, total program costs, and so forth.

B-2/C-5A COMPARISON COSTS

I wonder if you could compare the cost of the B-2 with its revolutionary technology to the cost of the C-5A or the Boeing 747?

General YATES. Yes, sir. I can.

We talked earlier that the costs of the B-2 in fiscal year 1989 dollars, the fly-away costs that we discussed with Senator Nunn, was \$273 million.

The C-5 fly-away costs, in 1989 dollars, is \$14 million.

If you looked at a 747-400, that's \$135 million.

So, you see that with the revolutionary capability and all the more complex systems that we have, it's roughly double the cost of airplanes which are basically passenger or cargo carrying.

I would add just for perspective, Senator Thurmond, that the B-2 is about 22 percent more expensive than the B-1.

Senator THURMOND. That's 22 percent?

General YATES. Yes, 22 percent.

But to put that in perspective, the B-52 was almost 250 percent more expensive than the B-47. And the B-58, which was the successor to the B-52, was 150 percent more expensive than the B-52.

Senator THURMOND. You may have already answered this question, but let me ask it of you directly.

As an Air Force General and leader, is the B-2 worth the price that it will now cost?

General YATES. Yes, sir. Absolutely.

As a matter of fact, I think that's an excellent question. There's been a lot of discussion about the cost, but not much discussion about the value of the B-2.

If you look at it in dollars and sense terms, not only the things that we've discussed earlier about the percentage of the targets that we need to attack with the B-2 in order to assure deterrence, and hopefully never to use the thing, but if you look at it in terms of dollars, relative to ICBMs, the Peacekeeper or to the Small ICBM, the dollars per warhead delivered are roughly half for a B-2.

[Deleted.]

So, the value of the B-2 is enormous in comparison with any other available technology.

Furthermore, there is flexibility that comes with the B-2, flexibilities that you don't get with anything other than another sophisticated manned penetrating bomber.

Clearly, we have focused on the strategic side of the B-2, but it also has a conventional capability. We've talked about START. It is the most stabilizing element. That's why everybody at Reykjavik agreed on the fact that for penetrating bombers without cruise missiles, they would only count as one, because it is a stabilizing system.

It can be used very effectively as a show of force without doing anything lethal.

So we think the value of the manned penetrating bomber is enormous, and, in particular, the B-2 we think is a tremendous value to the Nation.

Senator THURMOND. My time is up.

Mr. Chairman, I am in another committee, the Labor Committee, and am having to divide my time.

I have to leave now, but I want to ask unanimous consent that my opening statement follow yours in the record.

Senator EXON. Without objection, that is so ordered.

Senator NUNN.

Senator NUNN. Thank you.

Mr. Chairman, Senator Thurmond, the reason I'm on this side of the aisle is because of the prevailing wind. I switch with the prevailing wind, that is, when the chairman is smoking his cigar. [Laughter.]

Senator THURMOND. I am glad to see that you are flexible, and I have thought for a long time that this is the side of the aisle you ought to be on anyway. [Laughter.]

Senator NUNN. As long as the wind is blowing the way it is, I'm going to be over here.

Senator EXON. I would only remind you, Senator Nunn, that you now have 4 minutes left. [Laughter.]

Senator NUNN. General Yates, I think you just said something that is very much a key to this debate, and that is we are dwelling on the cost factors and not looking very much at the capability.

Do you have a presentation, an updated presentation, of the capability of the B-2 versus the B-1; the B-2 versus the B-52; the missions the B-2 can perform that cannot be performed by missiles; the missions that can be performed by the B-2 that cannot be performed by the standoff cruise missiles on a B-1?

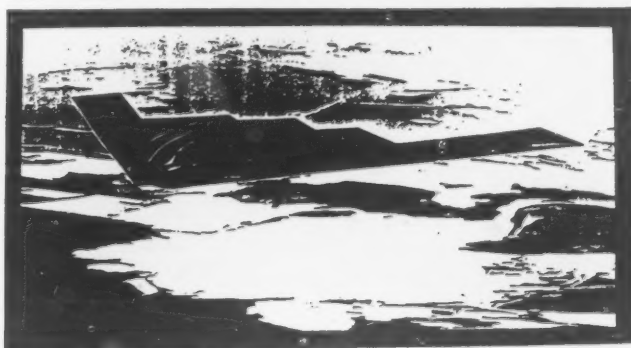
Do you have an updated visual portrayal of that kind of situation for the B-2?

General YATES. We don't have it, Senator Nunn, but we would be happy to put it together in short order.

[The information follows:]

[NOTE.—The attached visual presentation was referred to during hearing of the Senate Armed Services Committee July 21, 1989. The same presentation was also given to the House Armed Services Committee on July 12, 1989.]

The B-2 In Perspective



TITLE

THE PURPOSE OF THIS BRIEFING IS TO PRESENT THE B-2 IN THE OVERALL PERSPECTIVE OF ITS CONTRIBUTION TO THE TRIAD OF STRATEGIC NUCLEAR DETERRENT SYSTEMS AND IN ITS CONVENTIONAL ROLE.

Bomber Strengths in the Triad

The Triad has proven an effective means of providing long-term day-to-day deterrence, stability in crisis, and resilience to Soviet technological advances

- **Bomber force brings:**
 - **Efficient coverage for targets not requiring prompt response (about 60% of the targets)**
 - **Most versatile system for wide range of nuclear and conventional tasks**
 - **Most stabilizing deterrence - devastating retaliation without first strike threat**

SLIDE 1 BOMBER STRENGTHS IN THE TRIAD

IN THE INTEREST OF TIME AND FOCUS, THE BRIEFING SAYS LITTLE ABOUT THE SLBM AND ICBM LEGS OF THE TRIAD. IT IS USEFUL THOUGH, AT THE OUTSET, TO REMEMBER THAT THE TRIAD HAS PROVIDED A DAILY, ROBUST, RESILIENT AND EFFECTIVE DETERRENT FOR MORE THAN 3 DECADES AND WILL REQUIRE PLANNED MODERNIZATION TO CONTINUE TO SERVE ITS VITAL PURPOSE.

BUT TO FOCUS ON THE SUBJECT OF THIS BRIEFING, THE BOMBER FORCE IS SUITABLE FOR ABOUT 60% OF THE CURRENT LIST OF TARGETS THAT NEED TO BE COVERED FOR HIGH CONFIDENCE DETERRENCE. IT IS THE MOST VERSATILE SYSTEM FOR A WIDE RANGE OF TARGETS, AND IT IS REGARDED BY BOTH THE U.S. AND THE SOVIETS AS THE MOST STABILIZING ELEMENT OF THE STRATEGIC DETERRENT TRIAD.

BEFORE PROCEEDING FURTHER, IT NEEDS TO BE CLEAR THAT, IN THE INTEREST OF A MORE COMPLETE PERSPECTIVE, SOME SENSITIVE INFORMATION IS TREATED IN AN UNCLASSIFIED MANNER. HENCE, SOME PORTRAYALS ARE NOTIONAL, BUT THEY PRESENT A VALID PICTURE OF CAPABILITIES AND RELATIONSHIPS.

Targeting Task

All Weapons - Year 2000

Without START



- 1/4 of all weapons carried by penetrating bombers

With START



- 1/3 of all weapons will be carried by penetrating bombers
- Sufficiency of post START force depends on at least 230 penetrating bombers

Penetrating bombers are critical to the Triad

SLIDE 2 TARGETING TASK

THIS SLIDE PROVIDES ANOTHER INDICATION OF THE IMPORTANCE OF THE BOMBER LEG OF THE TRIAD. AS SHOWN HERE, WE WILL COUNT ON BOMBERS TO CARRY WELL OVER 40% OF ALL WEAPONS IN THE TIME PERIOD SHOWN IF THERE SHOULD BE NO START AGREEMENT. WITH AN AGREEMENT BASED ON CURRENT U.S. AND SOVIET NEGOTIATING POSITIONS, BOMBERS WOULD CARRY OVER 1/2 OF ALL WEAPONS.

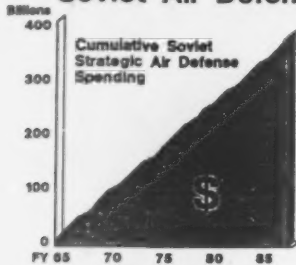
PENETRATING BOMBERS WOULD CARRY ABOUT 1/4 OF ALL WEAPONS WITH NO AGREEMENT AND WILL CARRY OVER 1/3 WITH AN AGREEMENT.

THIS INCREASED RELIANCE ON PENETRATING BOMBERS IS, AGAIN, DRIVEN BY THE CONVICTION ON BOTH SIDES THAT THESE ARE THE MOST STABILIZING FORCES. THAT CONVICTION IS REFLECTED IN THE REYKJAVIK COUNTING RULE WHICH COUNTS THE NON-CRUISE MISSILE, PENETRATING BOMBER AS ONE WEAPON REGARDLESS OF THE BOMB LOAD.

THAT COUNTING RULE AND A FORCE OF SOME 230 PENETRATING BOMBERS ARE IMPORTANT ELEMENTS OF STRATEGIC SUFFICIENCY IN A POST START ERA.

The Penetration Environment

Soviet Air Defense System



- 10,000 radars
- 3,000+ airborne interceptors & fighters
- 8,000+ surface to air missile launchers
- Airborne warning & control system



B-2 defeats huge Soviet investment in the world's largest and most expensive air defense system

SLIDE 3 THE PENETRATION ENVIRONMENT

HOWEVER, PENETRATING AGAINST THE ARRAY OF SOVIET DEFENSES, BUILT UP AT GREAT EXPENSE OVER THE YEARS AS SHOWN HERE WILL BECOME INCREASINGLY DIFFICULT. THE ESTIMATE IS THE SOVIETS HAVE INVESTED THE EQUIVALENT OF OVER \$350B IN THOSE DEFENSES OVER THE 20 YEAR PERIOD SHOWN AND THAT INVESTMENT CONTINUES.

THAT INVESTMENT HAS PRODUCED THE IMPRESSIVE QUANTITIES OF AIR DEFENSE SYSTEMS SHOWN.

ALSO SHOWN IS AN INDICATOR OF THE QUALITY IMPROVEMENTS AS OLDER FIGHTERS ARE REPLACED BY FIGHTERS WITH LOOK-DOWN, SHOOT-DOWN CAPABILITY AND OLDER SURFACE TO AIR MISSILE SYSTEMS ARE REPLACED BY NEWER, MORE CAPABLE SYSTEMS.

THAT VERY EXPENSIVE ARRAY OF DEFENSES IS LARGELY INEFFECTIVE AGAINST AN AIRCRAFT WITH B-2 CAPABILITIES.

Penetrating Air Defenses



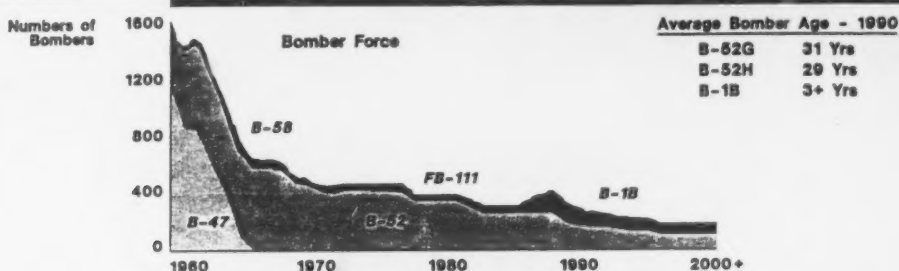
SLIDE 4 PENETRATING AIR DEFENSES

THIS NOTIONAL DEPICTION OF SOVIET DEFENSES ILLUSTRATES THE DENSITY OF DEFENSES IN THE HEAVILY DEFENDED AREAS OF THE SOVIET UNION WHERE MORE THAN 2/3 OF THE TOTAL TARGETS ARE LOCATED. BECAUSE OF THAT DENSITY, CONVENTIONAL AIRCRAFT MUST FIGHT THEIR WAY THROUGH THE DEFENSES RELYING ON SPEED, MANEUVERABILITY, ECM, AND LETHAL DEFENSE SUPPRESSION. EVEN SO, THEY FACE EARLY DETECTION, SIGNIFICANT TRACKING, AND WILL, THEREFORE, SUFFER HIGHER ATTRITION.

WHILE THE B-1 CAN DO THAT TODAY AND, WITH UPGRADES, CAN DO IT INTO THE MID-TERM (GENERALLY INTO THE LATER 90s) WITH ACCEPTABLE LOSSES, THAT CAPABILITY WILL ERODE TO THE POINT OF BECOMING INEFFECTIVE IN THOSE HIGHLY DEFENDED AREAS.

IN CONTRAST, THE B-2 CAN FLY THROUGH VIRTUALLY UNCHALLENGED BY AIR DEFENSE WEAPONS AND HAS THE RESILIENCE TO COPE WITH THE LONGER TERM IMPROVEMENTS IN AIR DEFENSES THE SOVIETS MAY CHOOSE TO MAKE.

What Happens If No New Penetrating Bomber?



■ Without a new penetrating bomber:

- In the midterm, we have less than 1/2 the required penetrating bomber force
- By the year 2000;
 - The force deteriorates to less than 200 bombers of which more than 1/2 would be 40 years old
 - We would lose most of the penetrating bomber's effectiveness

**A new bomber is essential to
continued effectiveness of the Triad**

SLIDE 5 WHAT HAPPENS IF NO NEW PENETRATING BOMBER?

BUT, IN SPITE OF THE WELL UNDERSTOOD ADVANTAGES OF STEALTH TECHNOLOGY, SOME HAVE PROPOSED ALTERNATIVES TO THE B-2.

ONE POSSIBLE ALTERNATIVE SUGGESTED IS NO NEW BOMBER. AS SHOWN, WE HAVE, OVER THE YEARS, REPLACED A FORCE OF SOME 1600 BOMBERS WITH A FORCE OF UNDER 350 HEAVY BOMBERS IN 1990 IN THE STRATEGIC NUCLEAR ROLE. WITH NO NEW BOMBER, THAT FORCE WOULD FALL TO LESS THAN 200 STRATEGIC NUCLEAR BOMBERS.

THAT WOULD LEAVE US WITH LESS THAN 1/2 THE PENETRATING BOMBER FORCE REQUIRED FOR AN ADEQUATE POST START FORCE.

FURTHER, OVER 1/2 THE TOTAL BOMBER FORCE WOULD BE 40 YEARS OLD BY THE YEAR 2000; AND WE WOULD LOSE THE CAPABILITY TO PENETRATE IN THE AREAS CONTAINING MOST OF THE IMPORTANT TARGETS.

IN SHORT, WE CANNOT MAINTAIN AN ADEQUATE STRATEGIC NUCLEAR DETERRENT FORCE IF WE LET THE BOMBER FORCE ATROPHY.

Penetrating Bomber Alternatives

(FY89\$)

- 132 B-2s Cost to complete _____ \$43B
- B-1 Alternatives
 - Equal numbers of aircraft _____ \$44B
 - 132 B-1s = \$37B + \$7B for added required air refueling tankers
 - Far less capable force
 - Roughly equal midterm capability against fixed targets _____ \$60B
 - 185 B-1s = \$51B + \$9B for added required air refueling tankers
 - Cannot match capability in the longer term at any price

B-2 is the only cost effective future bomber option

SLIDE 6 PENETRATING BOMBER ALTERNATIVES

A SECOND POSSIBILITY SUGGESTED IS TO REOPEN A B-1B LINE. WHILE THE B-1 CAN NEVER MATCH THE CAPABILITIES OF THE B-2, WE COULD REOPEN THAT LINE. PRODUCING B-1s IN NUMBERS EQUAL TO THE PLANNED 132 B-2s WOULD COST ABOUT \$37B AS COMPARED TO A COST TO COMPLETE THE B-2 PROGRAM OF \$43B.

HOWEVER, REFUELING CAPABILITY WOULD FALL FAR SHORT OF THE TOTAL REQUIREMENT AND ADDING JUST ENOUGH CAPABILITY TO COMPENSATE FOR THE DIFFERENCE BETWEEN THE RANGE EFFICIENCY OF THE B-2 AND THE B-1 WOULD ADD ANOTHER \$7B USING THE LOWEST COST APPROACH AVAILABLE.

AND, AGAIN, THAT BUYS A FAR LESS CAPABLE FORCE.

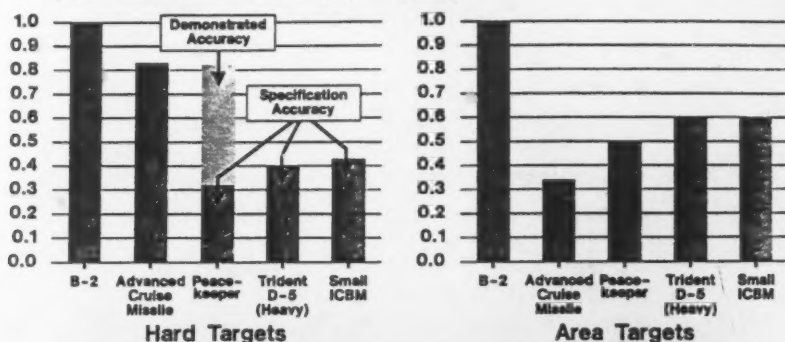
ADDING ENOUGH B-1s JUST TO COMPENSATE FOR THE LOWER MID-TERM PROBABILITY OF ARRIVING AT FIXED TARGETS WOULD RAISE THE B-1 REQUIREMENT TO AT LEAST 185 AND THE TANKER ADDITIVE REQUIREMENT TO ABOUT \$9B FOR A TOTAL OF \$60B.

AGAIN, IN THE LONGER TERM, AS DEFENSES BECOME MORE CAPABLE, IT WOULD NOT BE FEASIBLE TO SUSTAIN NEEDED BOMBER CAPABILITY BY JUST ADDING MORE B-1s.

NONE OF THAT SHOULD COME AS ANY SURPRISE. THE CONGRESS, FROM THE BEGINNING, HAS PROPERLY REGARDED THE B-1B AS A RAPIDLY ACHIEVABLE FIRST STEP IN BOMBER MODERNIZATION TO SUSTAIN BOMBER CAPABILITIES AND PROVIDE TIME FOR THE ORDERLY DEVELOPMENT AND DEPLOYMENT OF THE B-2.

Capability Comparisons

Individual Weapon Effectiveness (Normalized to B-2 Gravity Weapon)



The B-2 delivers the best accuracy and highest yield weapons in the Triad - other approaches require more weapons

SLIDE 7 CAPABILITY COMPARISONS

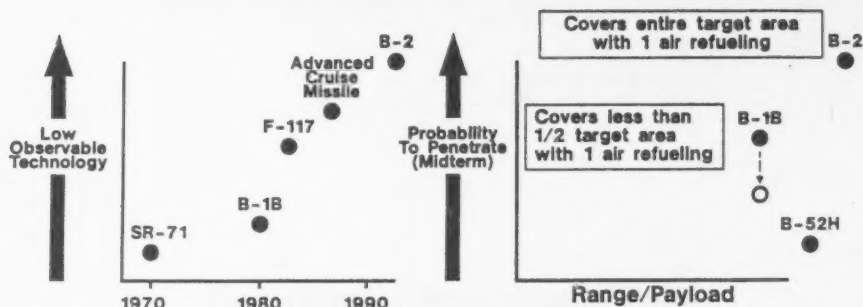
THE B-2 ALSO PROVIDES THE BEST COMBINATION OF ACCURACY AND WEAPONS YIELD OF ANY SYSTEM IN THE TRIAD. AS SHOWN, THE ACCURACY AND YIELD MAKE IT THE MOST EFFECTIVE SYSTEM AGAINST VERY HARD TARGETS - COMMAND AND CONTROL CENTERS, CONTROL FACILITIES, SUBMARINE FACILITIES, AND SO ON.

THE D-5 AND SMALL ICBM ARE SHOWN AT SPECIFICATION ACCURACY. AS IN THE CASE OF THE PEACEKEEPER, MORE TESTING MAY GIVE CONFIDENCE OF BETTER THAN SPEC ACCURACY.

THE HIGH YIELD ALSO MAKES IT THE BEST WEAPON AGAINST AREA TARGETS SUCH AS FORCE MARSHALLING AREAS, DISPERSED UNITS, ETC...

ANY ALTERNATIVE TO THOSE B-2 WEAPONS WOULD MEAN MORE WARHEADS REQUIRED TO HOLD THE TARGETS AT RISK. IN SOME CASES, THERE ARE SIMPLY NO FEASIBLE ALTERNATIVES.

Evolution of Technology for Stealth Vehicles



B-2 leverages competitive advantage in stealth technology and range/payload efficiency

SLIDE 8 EVOLUTION OF TECHNOLOGY FOR STEALTH VEHICLES

THE UNIQUE CAPABILITIES OF THE B-2 STEM FROM A REVOLUTIONARY BLENDING OF STEALTH TECHNOLOGY IN A LARGE AIRCRAFT WITH HIGH AERODYNAMIC EFFICIENCY AND LARGE PAYLOAD CAPABILITY.

THE EVOLUTION OF STEALTH IS ILLUSTRATED ON THE LEFT SIDE OF THIS CHART FROM THE FIRST CONCENTRATION ON COATINGS AND SHAPING TO REDUCE RADAR CROSS SECTION ON THE SR-71 AND THEN THE B-1B. WHILE THOSE ARE NOT WHAT WE REGARD, TODAY, AS STEALTH AIRCRAFT, THEY DID ADVANCE 1st GENERATION STEALTH WORK.

THE F-117 FIGHTER EMBODIES TRUE STEALTH TECHNOLOGY BUT IN A FIGHTER SIZE AIRCRAFT THAT PAYS SIGNIFICANT PENALTIES IN AERODYNAMIC AND ENGINE PERFORMANCE TO ACHIEVE A HIGH DEGREE OF STEALTH.

THE ADVANCED CRUISE MISSILE INTEGRATES STEALTH AND EFFICIENCY IN A SMALL VEHICLE WHILE THE B-2 ADVANCES THE STATE OF THE ART TO A LARGE, LONG RANGE, HIGH PAYLOAD BOMBER AS ILLUSTRATED ON THE RIGHT. THE B-52 HAS GOOD RANGE/PAYLOAD BUT RAPIDLY DWINDLING PENETRATION CAPABILITY.

THE B-2, IN CONTRAST, IS A HIGHLY SURVIVABLE BOMBER WITH THE RANGE AND PAYLOAD TO REACH ANY TARGET WITH A SINGLE AIR REFUELING. WITH THAT SAME SUPPORT, THE B-1 HAS THE RANGE TO COVER LESS THAN 1/2 THE TARGET AREA OR REQUIRES ABOUT THREE TIMES THE TANKER SUPPORT TO COVER AN EQUAL TARGET AREA.

FURTHER, OVER TIME, AS SHOWN, THE B-1's ABILITY TO PENETRATE WILL DECREASE WITH THE GROWING LETHALITY OF SOVIET DEFENSES. THAT DETERIORATION WILL COME SOONER IF WE FAIL TO MAKE THE PLANNED IMPROVEMENTS IN ECM CAPABILITY.

THE B-2 CLEARLY LEVERAGES OUR COMPETITIVE ADVANTAGE IN LOW OBSERVABLES TECHNOLOGY.

B-2 Capabilities

Search-and-Strike Capability

Against:

Relocatable and area targets, aim point adjustment,
Look-before-shoot

Before B-2:

Very low altitude operations and limited sensor
field of view + strict routing for survival +
stringent fuel limits = few targets at risk

After B-2:

Higher altitudes and better sensor field of view +
flexible routing + higher survivability +
greater range + integrated avionics =
more targets at risk

**Even a modest increase in Soviet targets at risk brings
a reduction in Soviet attack confidence
with an increase in deterrence**

SLIDE 9 B-2 CAPABILITIES

MUCH HAS BEEN SAID IN RECENT MONTHS ABOUT ATTACKING RELOCATABLE TARGETS. LET ME SAY AT THE OUTSET THAT ATTACKING HIGHLY MOBILE TARGETS IS NEITHER THE REASON FOR THE B-2 NOR IS IT LIKELY TO BE ACCOMPLISHED WITH GREAT EFFICIENCY IN THE NEAR TO MID-TERM FUTURE. HOWEVER, THE B-2 IS THE BEST LONGER TERM HOPE FOR THAT JOB.

MORE IMPORTANT, THERE ARE SIGNIFICANT TARGETS WHOSE GENERAL LOCATION IS KNOWN OR AT LEAST HIGHLY SUSPECTED, AND THERE ARE OTHER AREA TARGETS WHERE THE EFFECTIVENESS OF THE ATTACK CAN BE SIGNIFICANTLY IMPROVED WITH AIM POINT ADJUSTMENT BASED ON A RADAR OR VISUAL CHECK.

THERE ARE STILL OTHER FIXED LOCATIONS THAT MAY OR MAY NOT BE OCCUPIED BY VALUABLE WAR FIGHTING ASSETS.

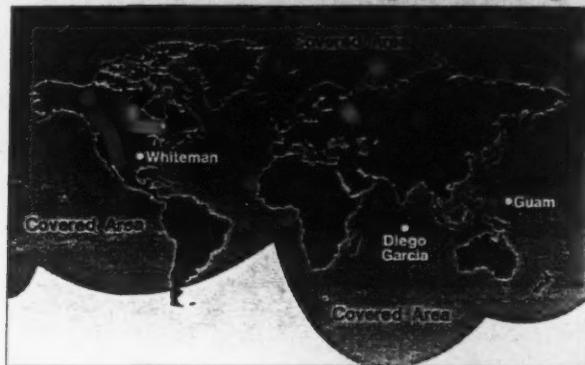
IN ADDITION, SOME TARGETS ARE OF SUCH IMPORTANCE THAT MULTIPLE SYSTEMS ARE CROSS TARGETED TO HEDGE AGAINST FAILURE OF ONE WEAPON TO REACH THE TARGET. AGAIN, THE B-2 CREW CAN VERIFY THE TARGET CONDITION BEFORE COMMITTING A WEAPON.

AIRCRAFT THAT MUST OPERATE AT LOW ALTITUDE WITH LIMITED SENSORS AND LIMITED FLEXIBILITY AND STAYING POWER HAVE LITTLE CAPABILITY AGAINST THESE TARGETS. THE B-2 WILL HAVE MUCH MORE FOR THE REASONS SHOWN.

ALL THOSE B-2 CAPABILITIES INCREASE THE EFFECTIVENESS OF LIMITED NUMBERS OF WARHEADS. THE SOVIETS ARE WELL AWARE OF THESE CAPABILITIES, AND THEY ADD TO DETERRENCE.

B-2 Conventional Capability Worldwide Force Projection Capability

- 50,000 lb payload + 1 refueling covers the global land mass

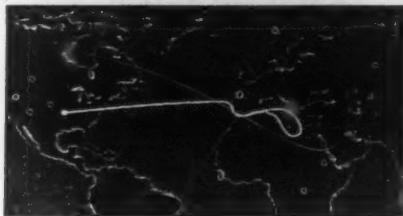


**B-2 can hold virtually every target
in the world at risk**

SLIDE 10 B-2 CONVENTIONAL CAPABILITY

THE B-2 CAN ALSO MAKE A POWERFUL CONTRIBUTION WITH ITS CONVENTIONAL CAPABILITY. AGAIN, THE RANGE/PAYLOAD EFFICIENCY ALLOWS IT TO COVER ALL THE WORLD'S LAND AREAS FROM THREE LOCATIONS WITH A SINGLE AIR REFUELING. THE LOCATIONS SHOWN ARE REPRESENTATIVE - THE 1st B-2 BASE IN MISSOURI, DIEGO GARCIA, AND GUAM.

B-2 Conventional Capability



Libyan Raid:

- 2 carrier battle groups (20 ships)
- 35 support aircraft
- 84 combat aircraft
- 134 crew members at risk
- 5 days in execution
- 8 foreign bases

A B-2 Option:

- A small force of B-2s and KC-10s operating from and returning to U.S. soil could deliver the same payload



Would We Risk B-2s?

Yes:

- Very low risk
- Total cost of B-2 force package much less than package employed

B-2 is a viable conventional option for a wide variety of real world contingencies

SLIDE 11 B-2 CONVENTIONAL CAPABILITY - LIBYAN RAID

HOWEVER, SOME ARE SKEPTICAL ABOUT COMMITTING B-2s TO CONVENTIONAL TASKS BECAUSE OF COST. IT IS USEFUL TO RECALL THAT WE COMMITTED TWO CARRIER BATTLE GROUPS AND SOME 120 AIRCRAFT OPERATING FROM THOSE CARRIERS AND EIGHT FOREIGN BASES TO THE RETALIATORY RAID ON LIBYA. SOME 134 CREW MEMBERS ACTUALLY FLEW IN HARM'S WAY TO DO THAT JOB, THOUGH IT IS TRUE THAT THE SUPPORT AND THE ELEMENT OF SURPRISE MINIMIZED THE RISK. IN FACT, THE ONLY LOSS WAS PROBABLY AN OPERATIONAL ACCIDENT ON THAT VERY LONG, TOUGH MISSION.

IN CONTRAST, A SMALL FORCE OF B-2s AND KC-10s, OPERATING FROM U.S. SOIL COULD DELIVER THE SAME PAYLOAD.

SO, WHILE THAT PARTICULAR TASK MAY NOT BE THE ONE FOR THE HEAVY B-2 PAYLOAD, THE POINT IS, WE ARE OBVIOUSLY WILLING TO TAKE FAR MORE THAN THE VERY SMALL RISK TO B-2s THAT WOULD ENTAIL. THE CHARACTERISTICS OF THE B-2 WOULD HAVE MADE THE RISK MINUSCULE, ESPECIALLY WITH THE EASE OF MAINTAINING VERY HIGH SECRECY AND SURPRISE OPERATING WITH A SMALL FORCE FROM U.S. SOIL.

B-2 Cost In Perspective

- R&D investment yields a stream of benefits far into the future
- About 3/4 of R&D and 1/3 of total B-2 cost already invested
- Most valid comparison to other systems is flyaway cost

Cost Comparison (FY89\$)

B-1B(\$228M) **20%** → B-2(\$274M)

Bomber Procurement as Percent of DoD Budget Over Procurement Period

■ B-52	1952-61	1.4%
■ B-1B	1982-86	1.6%
■ B-2	1987-96	1.3%

SLIDE 12 B-2 COST IN PERSPECTIVE

TURNING TO THE COST ISSUE, THE TOTAL PROGRAM COST HAS BECOME FAR TOO MUCH OF THE FOCUS. R&D COST FOR ANY PROGRAM DEPENDS ON HOW MUCH WE'RE EXPLOITING NEW TECHNOLOGY. IN THE CASE OF THE B-2, WE ARE DEVELOPING AND FIELDING NEW TECHNOLOGY THAT WILL YIELD A STREAM OF BENEFITS FOR YEARS TO COME. ALL FUTURE, FIXED WING, COMBAT AIRCRAFT WILL USE STEALTH TECHNOLOGY.

AND, ABOUT 3/4 OF THE R&D COST OF THE B-2 IS ALREADY INVESTED AS IS ABOUT 1/3 OF THE TOTAL PROGRAM COST. MOST OF THE REMAINING INVESTMENT IS IN PRODUCTION. FOR THOSE REASONS, THE MOST VALID COST COMPARISONS ARE BASED ON FLYAWAY COSTS. ON THAT BASIS, THE B-2 COSTS ABOUT 20% MORE THAN THE B-1.

AS TO AFFORDABILITY, AS SHOWN ON THE BOTTOM OF THE SLIDE, THE TOTAL B-2 PROGRAM CONSUMES A SMALLER PART OF THE TOTAL DOD BUDGET OVER THE PROCUREMENT PERIOD THAN EITHER OF THE LAST TWO LARGE BOMBER PROGRAMS. AND AS THE MIDDLE COLUMN INDICATES, WE TEND TO BUY BOMBERS IN BUNCHES WITH PERIODS BETWEEN SO THE INVESTMENT IN THE B-2 WILL PAY BACK IN DETERRENCE FOR THE NEXT 30 YEARS OR SO.

TAKEN IN THAT CONTEXT, THE PROGRAM IS BOTH AFFORDABLE AND ESSENTIAL.

Cost & Value Per Warhead Comparison

(Total Program Costs In FY89\$)

	Program Cost (\$B)	Cost/Warhead (\$M)	
B-2	66	31	\$16M (Flyaway)
B-1B	39	28	\$16M (Flyaway)
PKRG	25	50	
SICBM	26	52	
Trident D-5	75	19	

**B-2 provides highest value deterrence
for the investment**

SLIDE 13 COST & VALUE PER WARHEAD COMPARISON

COMPARED TO OTHER NEW STRATEGIC SYSTEMS, IT'S ALSO COST COMPETITIVE IN COVERING TARGETS. WHILE TARGET COVERAGE IS COMPLICATED BY PROBABILITY OF PENETRATION, WARHEAD EFFECTIVENESS, FLEXIBILITY, AND OTHER FACTORS, MOST OF THOSE FACTORS MEAN THIS CHART UNDERSTATES THE CASE FOR THE B-2. BUT, EVEN ON THIS BASIS, THE COST PER WARHEAD FOR THE B-2 IS ABOUT THE SAME AS THE B-1, THOUGH ITS EFFECTIVENESS IS MUCH HIGHER. THE CHART ALSO SHOWS PROGRAM COST OF BOMBER WEAPONS IS CONSIDERABLY LOWER THAN FOR THE NEW ICBMs AND THE FLYAWAY COST PER WEAPON IS CONSIDERABLY LOWER STILL.

DUE TO THE LARGE BUY, THE HEAVILY MIRVED D-5 COMES IN AT A LOWER COST PER WARHEAD THAN THE OTHER SYSTEMS ON THIS CHART AND THAT PROGRAM IS STRONGLY SUPPORTED THROUGHOUT DOD AND THE CONGRESS.

THE HIGH COST PER WARHEAD FOR THE ALSO HEAVILY MIRVED PEACEKEEPER IS DUE TO THE SMALL NUMBERS OF MISSILES APPROVED FOR DEPLOYMENT.

B-2 Risk Reduction

- Seven years of risk closure behind us
- Most extensive computer aided design and simulations in history of aircraft development
- Extensive development testing
 - 24,000 hours wind tunnel
 - 44,000 hours avionics test and evaluation
 - Avionics test bed flying since Nov 86
 - 6,000 hours flight control test and evaluation
- Careful performance milestone driven program review

**Early, extensive risk reduction
gives high confidence in progress**

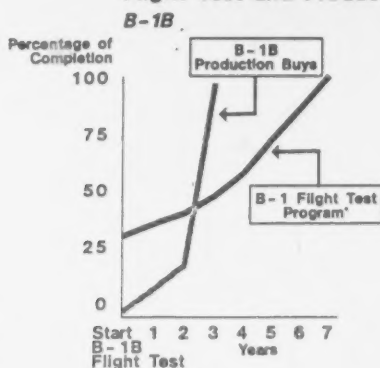
SLIDE 14 B-2 RISK REDUCTION

THE DELAY IN 1st FLIGHT OF THE B-2 HAS LED TO CONCERN ABOUT PROGRAM RISK. THE FACT IS THE PROGRAM WAS DELAYED TO REDUCE PROGRAM RISK. THE FRONT END OF THE B-2 PROGRAM INCLUDED THE MOST COMPREHENSIVE RISK REDUCTION PROGRAM WE'VE EVER UNDERTAKEN, ALONG WITH THE MOST EXTENSIVE COMPUTER AIDED DESIGN AND SIMULATION PROGRAM IN THE HISTORY OF AIRCRAFT DEVELOPMENT.

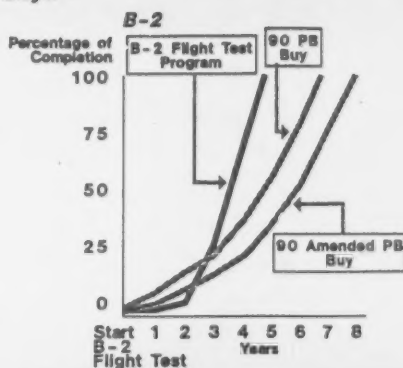
CLEARLY, WE ALL LOOK FORWARD TO THE FLIGHT TEST PROGRAM TO CONFIRM THE ENGINEERING AND SIMULATION ANALYSIS. BUT THERE IS NO REASON TO BELIEVE THE RISK IS HIGHER THAN WE SHOULD ACCEPT.

Concurrency Comparison

Flight Test and Production Buys



*Includes applicable
B-1A flight test hours



**B-2 program has already been
adjusted to ensure prudent risk**

SLIDE 15 CONCURRENCY COMPARISON

AS TO CONCURRENCY AND THE FLY BEFORE BUY CONCERN, IT IS TRUE, AS SHOWN ON THE LEFT, THAT THE B-1 WAS A HIGHLY CONCURRENT PROGRAM STRUCTURED TO PRODUCE THE MOST CAPABILITY AT THE LOWEST COST IN A PROGRAM WHERE THE RISK WAS CONSIDERED LOW TO MODERATE IN MOST AREAS. THE CHART SHOWS THE RAPID BUILDUP IN PRODUCTION RELATIVE TO TESTING PROGRESS.

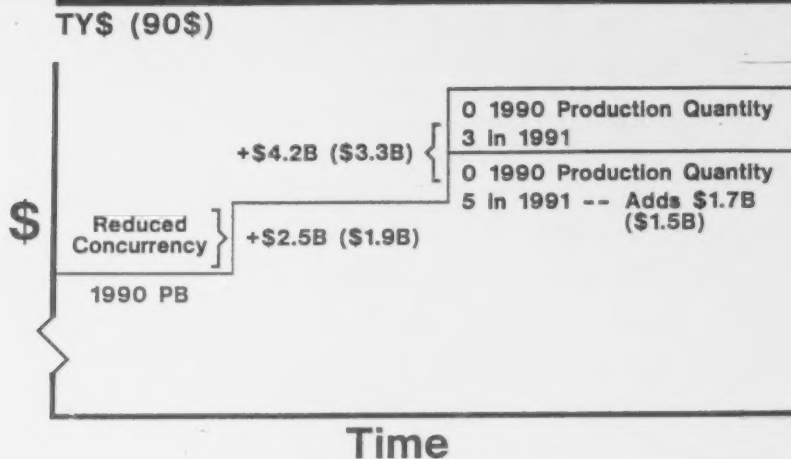
WE HAD COMPLETED ONLY SOME 50% OF THE FLIGHT TEST PROGRAM WHEN PRODUCTION QUANTITIES WERE FUNDED AT 100%.

IN CONTRAST, THE TECHNOLOGICAL CHALLENGES OF THE B-2 HAVE BEEN WELL UNDERSTOOD FROM THE OUTSET. AS SHOWN, WE HAVE ADJUSTED THE SCHEDULE WITH THE SLIP IN 1st FLIGHT. AS A RESULT, WE WILL HAVE FAR MORE FLIGHT TEST ACTIVITY BEHIND US BEFORE COMMITTING TO LARGE NUMBERS OF PRODUCTION AIRCRAFT AND WELL BEFORE DELIVERIES WHICH TEND TO LAG PRODUCTION FUNDING BY MORE THAN 2 YEARS.

WE'LL REACH 50% OF FLIGHT TEST COMPLETED WITH LESS THAN 20% OF PRODUCTION AIRCRAFT ON CONTRACT.

FURTHER, THE EARLIEST TESTING WILL CONFIRM THE AIRFRAME AND ENGINE DESIGN PARAMETERS. IN THE FIRST 2 YEARS WE WILL HAVE EXPLORED THE ENTIRE FLIGHT ENVELOPE; 90% OF PROPULSION TESTING WILL BE COMPLETE AND 70% OF RADAR SIGNATURE TESTING WILL BE COMPLETE ALONG WITH TESTING OF OTHER SYSTEMS, FLIGHT LOADS, ETC.

Cost of Delay



SLIDE 16 COST OF DELAY

AND THERE IS A POWERFUL DOWNSIDE TO ADJUSTING THE SCHEDULE MORE THAN IS REQUIRED FOR PRUDENT RISK FROM CONCURRENCY. SLIPPING THE SCHEDULE IS INEVITABLY EXPENSIVE.

AS INDICATED, THE ADJUSTMENT IN THE 1990 AMENDED BUDGET, RESPONDING TO CONCERNS ABOUT CONCURRENCY, ADDED SOME \$2.5B (TY\$).

IF CURRENT PROPOSALS TO ZERO PRODUCTION QUANTITY IN FY90 PREVAIL, THE ADDED COST WOULD BE ABOUT \$1.7B (TY\$) IF WE COULD MAINTAIN THE SCHEDULE IN 91 AND BEYOND AFTER ZERO QUANTITY IN FY90. IF NOT, AND WE INSTEAD SIMPLY SLIDE THE SCHEDULE ONE YEAR TO THE RIGHT, THE COST INCREASE WOULD BE \$4.2B (TY\$).

AND, ALL THOSE NUMBERS ASSUME ENOUGH PRODUCTION FUNDING IN 1990 TO CONTINUE WORK ON THE 1989 AND PRIOR PRODUCTION AND SOME SUBCONTRACTOR WORK FOR 1991 AND BEYOND TO AVOID ANY PRODUCTION GAPS. DEPENDING ON THE OUTYEAR PROFILE, THAT REQUIRES APPROXIMATELY \$1B IN PRODUCTION FUNDING IN 1990 EVEN WITH ZERO PRODUCTION QUANTITY. WITHOUT THAT FUNDING THE PRICE OF THE SLIP GOES STILL HIGHER.

Summary

Why the B-2?

- The B-2 provides enduring penetration capability for the bomber force - outpaces Soviet air defense improvements - maintains the effectiveness of the strategic Triad
- Cost is not low but the B-2 is affordable and its strategic value is very high
- Program is challenging but risk is reasonable
- START limits now being considered make the B-2 even more important to a strong Triad
- The B-2 also has high utility in the conventional role
- Leverages revolutionary technological superiority

SLIDE 17 SUMMARY

Senator NUNN. Well, I think the B-2 is in trouble. I think we need to take a look at what the conventional role of the B-2 may be over the next 20 years, not that it will start off that way, but what it will evolve into.

General YATES. We would be happy to do that, sir.

Senator NUNN. Now I am one who has supported the B-2. But when we get out on that floor, and I think Senator Exon would agree with this, it is going to be very hard to defend. It will be hard to defend in the conference. All these fly-away costs, then-year costs, comparisons and all of that, those are relevant and valid, but they are awfully hard to convey to people.

People are going to be focusing on mainly one thing. Unless we have a presentation that shows clearly what the real capabilities of the B-2 are, they are going to be focusing on the \$500 plus million per aircraft. There are also going to be charts up there before we get through this debate, maybe this year or next year, but I can see them already. They are going to show what we could buy with that amount of money; the alternatives. They will show what \$500 million will buy for other aircraft, what \$48 or \$49 more billion would buy in conventional forces, what it would buy in other military requirements, as well as what it would buy in nonmilitary areas.

So we are going to need something, I believe, when we go to the floor of the Senate in late July that can be presented in an unclassified form as to what the B-2 will do.

General YATES. We will provide that, sir.

[The information was not provided by witness in time for printing.]

Senator NUNN. It may be that we will have to have a special session, a classified session in S-407, on some of the things that are classified. But I would urge you to take a look in the next 2 weeks, between now and the time we mark up, which will be after the 4th of July, at what you can do, unclassified, in terms of capabilities, and what you can do, classified, in terms of capabilities.

We will need this before the markup. I think we need to be able to make a presentation to this committee, to this subcommittee. Senator Exon needs to have what the capabilities are, and particularly what we can do with the B-2 that we can't do with the B-1, and what we are going to be able to do with the B-2 over the next 10 to 20 years, anticipating even what would happen after START.

Why do we need it after START? Most people seem to think that we are going to have a START agreement. I know the way the Pentagon plans, it is awfully hard to get on a piece of paper and get approved what may happen after START, but I think you have to address that.

Otherwise, I see the B-2 taking a crippling blow this year and being in trouble, possibly even finished off by the troubles within the next 2 or 3 years.

I do not want an exaggerated presentation. I am not asking for something that is not accurate. I am asking for something that is hard, cold fact. We have to be able to justify it.

I also think all of these costs that we have been going over need to be able to be portrayed on one chart. We need a chart. You gave three categories of costs. One category was fly-away; another was production; another was acquisition.

We need to have a definition of each one of those on a chart. We need to have an itemization of what the B-2 costs on each one of those. We need to have a comparison with the B-1, what it costs in each one of those categories, in updated dollars.

There is one other thing I would like to get you to respond to; maybe you can do it today, or maybe you will have to furnish it. You are talking about the overall unit cost of the B-2 at \$500 million. Just putting it in a little bit different light, how much would it cost us to resurrect the B-1 and to buy it today, with today's and tomorrow's dollars, and how much would it cost if we are going to build it not to exceed [deleted] a month, like we are doing with the B-2?

By this I mean I would like to know what the B-1 costs really are, not the \$20.5 billion ceiling definition, but what the B-1 costs really are. I want an apples and apples comparison.

I know I am asking you for a lot. But we are talking about whether this program is going to go anywhere.

General YATES. Sir, for the last question, I would like to provide that to you so that we can do an accurate job on it.

[The information follows:]

B-1

Cost estimates on B-1B additional quantities over and above the original 100 aircraft buy are sensitive to the cost estimating assumptions used (e.g. learning curve, production rate, T-1 vice T-4). In addition, B-1B costs for comparative purposes should also include the cost of additional tanker requirements. The following reflect

a range of cost for an equal number of B-1Bs and an equivalent number of B-1Bs compared to the B-2 buy:

[in billions of dollars]

	Fiscal year 1989	
	132 aircraft	Equivalent force
B-1B.....	33-37	42-50
Additional tankers.....	7	11
Total program costs.....	40-44	53-61

General YATES. But, just to give you the right mindset on it, we have looked at that and I'll have to go back to make sure that I do it at the [deleted] rate and all those things.

But a few years ago, about in 1986, when we worked with Rockwell to find out what would it cost to build 132 B-1s, the answer was \$37.5 billion, assuming that you just tacked those on to the end of the line. In other words, you restarted the line and didn't lose any of your nonrecurring tooling or anything. Well, we've lost a lot of that now.

We have not lost it all, though.

Senator NUNN. It's \$37 billion to build 100?

General YATES. It's 132, the same number.

Senator NUNN. As compared to \$47 billion or \$49 billion more to build a B-2?

General YATES. Yes. The cost to go for the B-2 is roughly \$40 billion.

Senator NUNN. That's \$40 billion?

General YATES. Yes, \$40 billion.

Senator NUNN. So that's roughly the same.

General YATES. Yes. But that is roughly the most optimistic B-1 picture that I can give you, because we would have to do some of the nonrecurring over again.

Now, the worst number I can give you is about \$51 billion to do the 132 B-1s, and I think the number is between those two but more toward the \$51 billion than it is at the lower end.

Senator NUNN. What are the comparable numbers for the B-2?

General YATES. It's about \$40 billion.

Senator NUNN. I thought it was \$49 billion.

General YATES. I'm sorry. By "comparable numbers," do you mean for the whole?

Senator NUNN. For the rest of them. From here on out.

General YATES. For the rest of them, it's about \$40 billion.

Senator NUNN. Here is one comparison that we really need, and I think you have just given it. But I want to make sure about what I am hearing.

If we were to absolutely cancel out the B-2 program right now, bang, that's it, and say we want 132 more B-1s, how much is that number, to get the B-1 back into production and to build it, compared to the B-2?

General YATES. We'll provide that to you, Senator. I'm confident that it is very close to the same number, if not more for a B-1.

So, in other words, the point is if you are going to build a modern bomber today, and you are going to build about 130—and we had the conversation earlier that that's about what we need to do the job—you're going to pay pretty much the price for those airplanes. This is because in both cases, the R&D was behind us. In other words, the R&D is behind us on the B-1 and essentially the R&D is behind us on the B-2, which is the revolutionary and high cost portion of the program.

[The information follows:]

B-1B

Cost estimates on B-1B additional quantities over and above the original 100 aircraft buy are sensitive to the cost estimating assumptions used (e.g. learning curve, production rate, T-1 vice T-4). In addition, B-1B costs for comparative purposes should also include the cost of additional tanker requirements. The following reflect a range of cost for an equal number of B-1Bs and an equivalent number of B-1Bs compared to the B-2 buy:

[In billions of dollars]

	Fiscal year 1989	
	132 aircraft	Equivalent force
B-1B	33-37	42-50
Additional tankers	7	11
Total program costs	40-44	53-61

STRATEGIC MISSION OF B-2

Senator NUNN. In your own words, General, tell me what the strategic mission is of the B-2 now? What is the strategic mission in terms of nuclear capabilities? What's it going to do?

General YATES. It's a manned penetrating bomber. It attacks all categories of targets—hard targets, soft targets. But, fundamentally, it is the classic manned penetrating bomber mission.

Senator NUNN. What is the case for a manned penetrating bomber in the age of missiles and standoff weapons and accuracy that is increasing? Why do we need a manned penetrating bomber?

General YATES. There are the classical arguments on its recallability and stability.

Senator NUNN. But you can get those with a stand off weapon in a B-1.

General YATES. [Deleted.] Further, there is an efficiency factor. The manned bomber, before it drops the bomb, is going to check the target. If the target has already been destroyed, then he is not going to drop the bomb.

Senator NUNN. But, General, you're talking about after a nuclear war has already begun. You know, if you've already shot missiles all over the world, you've laid down weapons over here and over there, and the whole world has gone up in smoke, and you are talking about the efficiency of targeting at that stage, of flying over and saving one weapon?

That's the environment you are in. The world is already blown up. We are not doing an efficiency ratio at that stage about which one we can marginally kill another target with cheaper when we have been hit already by several thousand missiles.

General YATES. Now I don't want to be put in that box. I'm not trying to argue with you in that regard.

Senator NUNN. I'm trying to play Devil's Advocate. I want you to tell me how I am going to answer somebody who asks what in the heck is this thing going to do after the war.

General YATES. Let me say, fundamentally, that if we are in the area of answering your question, which is what the strategic mission is, we have failed anyway because we are buying deterrence. We are not trying to fight with this weapon.

But I guess I have to respond to you as if we have failed, and if we have failed, then the job unfortunately, is to destroy as many of the targets as we can.

So, given that we are carrying on the B-2 16 weapons, a manned bomber does not have to blindly deploy those 16 weapons—in other words, like you do if you are a standoff missile carrier. You have to go after the targets you plan on going after. You do not know if they exist or not. And you have to fire. Furthermore, there will be some of those targets which will have to be backed up if they are truly important. In other words, we'll have to send two or more standoff weapons after it.

None of this is true with a penetrating bomber.

So what I am trying to say to you is that you can't say, just say that the penetrating bomber, because it has 16 weapons, will cover 16 targets. He will be able to attack 16 targets, which is a bigger number of targets covered, after this holocaust has already started.

So, the efficiency factor on a manned penetrating bomber is higher than on any other weapon system, because of the [deleted].

Furthermore—and I would like not to make too much of this—on the relocatable target issue, which has been the subject of much conversation, the B-2 does have a limited a very limited, capability to check and see. If by other means we know about where relocatable targets would be, the B-2 has the ability to check and find out if they are there.

Now, in the future, the B-2 can be improved [deleted] and, in fact, would offer the most capability of attacking relocatable targets.

So, it is our platform of choice to do that job. It would have to be improved from what we are building today.

Senator NUNN. Thank you.

Senator EXON. Thank you, Senator Nunn.

Before I recognize Senator Levin, just let me say, gentlemen, that the questions of Senator Nunn and the statements that he just brought up are concurred in completely by this Senator. I am going to get into that a little bit further in the second round.

The raid on the B-2 is on in this committee: to put it aside and fund everything we can think of, some of the programs that have been suggested be canceled and others. There is going to be a major battle on this. I suspect that the Pentagon does not recognize at the present time the difficulty the B-2 is in, and I will get into that with some other questions in the second round.

There is one thing that I think would be helpful. For those of us who are trying to support the B-2, we recognize it as a significant leap forward. It would be nice if that airplane would fly sometime before we have to debate this on the floor. It would be somewhat helpful.

Senator Levin.

Senator LEVIN. Thank you, Mr. Chairman.

B-2 FLY DATE

Senator WARNER. Excuse me, but was there a response to the very good question about the fly date? I think it was in July.

Senator EXON. They think it is a matter of the next few weeks.

Senator WARNER. Is it a fixed date or a moving target?

Mr. WELCH. It flies when it's ready to fly. It's a moving target, but I'd say that it's in the early part of July.

Senator WARNER. So the chairman's observations are very astute.

Senator NUNN. Or if we could announce it flew over six times at low levels and nobody saw it. [Laughter.]

Senator WARNER. And nobody heard it. [Laughter.]

Senator EXON. And if it crashes, you don't have to report that. [Laughter.]

Mr. WELCH. I can assure the committee that we're as anxious for it to fly as everyone else.

Senator EXON. Senator Levin.

B-2—PENETRATING BOMBER

Senator LEVIN. You have made the case for why you want a B-2 penetrating bomber. That's what you were addressing.

Now, if you get a B-2 bomber and it's a penetrating bomber, then that raises the question as to why you want to invest a whole lot of additional funds to make the B-1 a penetrating bomber instead of a stand-off bomber.

Can you address that question, why we should make the B-1 a penetrator if we have a B-2 penetrator?

General YATES. Senator Levin, we had a conversation a few moments ago about covering the target set that we have to cover.

Now, the Air Force plans on covering about [deleted] of the target set with B-2s and [deleted] with B-1s. [Deleted.]

Some judgments have been made about what we have to attack in order to assure deterrence, which is obviously what we are trying to do.

So my answer to you is of those targets which we think are best attacked by penetrating bombers, then it comes out to be about [deleted] and about [deleted] of them are allocated to the B-2 and [deleted] are allocated to the B-1.

Senator LEVIN. Are the richer targets the B-2 targets?

General YATES. No, sir.

Senator LEVIN. How are they allocated?

General YATES. Specifically, I would have to get the operational planners over here to give you a better answer to that than I can give you.

Senator LEVIN. But you're talking about deterrence now. So presumably the other side should be aware of what, well, not what targets, but at least of how many targets we're capable of hitting.

General YATES. In a general sense they should.

Senator LEVIN. Is there any particular principle that applies to which targets are allocated to the B-2 and which to the B-1?

General YATES. At this point, as far as planning the allocation, one is going to depend on target defenses; two would depend on—

Senator LEVIN. The better the defense, the more the need for a B-2?

General YATES. Yes, sir. It can attack a more highly defended target, with greater assurance than can a B-1.

MAINTAINING B-1 AS A STAND-OFF BOMBER

Senator LEVIN. Give me the type of target that you think the B-1 would be hitting that it couldn't hit as a stand-off bomber. I'm talking about the B-1 now, assuming the B-2 is built.

Senator WARNER. Could you repeat the question? It's a good question and I want to be sure I heard it all.

Senator LEVIN. Yes.

Assuming the B-2 is built, then the question is do we want to invest a lot more money to make the B-1 a better penetrator?

We have that issue here in front of us, too. It has defects.

The question is do we want to lay out a lot of additional money, Pentagon money, to make the B-1 a better penetrator, or just use that as a stand-off bomber?

Senator WARNER. And let the B-2 do the role the upgraded B-1 could do.

Senator LEVIN. Right.

General YATES. Hardened multiple targets, like missile silos, which would not all be fired in the initial opening—some would be held in reserve—we would like to attack those targets. Those would be lucrative B-1B targets.

Senator LEVIN. Let's just stop there.

Take a missile site. Are you saying that the B-1B as a penetrator is a better way to hit that silo than a B-1B as a stand-off bomber?

General YATES. Yes, sir.

Senator LEVIN. With a cruise missile? Because of accuracy or because of uncertainty as to whether or not you still want to hit it?

General YATES. Yes.

Senator LEVIN. Both?

General YATES. Yes, and also because it carries a larger warhead.

Senator LEVIN. Are you talking about nuclear warheads?

General YATES. Yes, sir.

Senator LEVIN. And there is some question as to the accuracy of a cruise missile that is delivered from a stand-off B-1 to knock out a silo?

General YATES. Yes, sir.

You know, depending on the hardness of the missile silo—and, don't forget, [deleted].

Senator LEVIN. Relatively small meaning how many?

General YATES. In round numbers, about [deleted] kilotons.

Senator LEVIN. [Deleted.]

Mr. WELCH. Yes.

General YATES. It is a percentage thing.

Senator LEVIN. What is the percentage either way?

General YATES. Well, I guess I don't know that off the top of my head. I will have to give it to you.

Senator LEVIN. Okay, then.

[The information follows:]

ADVANCED CRUISE MISSILE PROGRAM

Probability of Damage (PD) is a function of warhead yield, warhead delivery accuracy (miss distance), and target hardness. The Advanced Cruise Missile carries the [deleted]. The missile's specification delivery accuracy, which has been successfully demonstrated during flight test, [deleted]. Finally, current intelligence estimates for the upgraded [deleted]. Using these three factors [deleted].

Mr. WELCH. Senator Levin, one of the questions that did not get answered, I think, in your question is the fact that the original address to targets and to deterrence started off with 340 bombers, all penetrating in one form or another. Over a period of time, the threat changes, penetration ability changes, the whole calculus and dynamic of the situation changes.

So an answer that you get at any different time has to be addressed to that.

I couldn't tell whether you were suggesting buying one in place of the other.

Senator LEVIN. I'm just saying that there is a real question in my mind as to whether or not you need to put a lot more money into the B-1 to give it greater penetrating capability, instead of leaving it as a stand-off bomber when you're in the middle of a nuclear war and you have a penetrating bomber in the B-2.

I'm assuming that you do have a B-2 now.

I mean, the accuracy of an Advanced Cruise Missile is tremendous. I am surprised to hear you say that there is some doubt as to whether or not an Advanced Cruise Missile could knock out a silo.

I think it has a hell of a lot better chance of knocking out a silo than a B-1 as a penetrator, by the way, because a cruise missile can penetrate better than a B-1 can.

Senator EXON. I would just caution here that we may be getting into an area that is going to be addressed in the second part of our hearing.

We also may be getting into an area here that we should not be discussing at this classification level.

But it is a very good question. Answer it as best you can, given the classification that we are in.

General YATES. You are right about the accuracy of an ACM. It is excellent, and we are going to talk about that in the next presentation.

The point is that you basically have to allocate one missile against each missile silo that we know exists today.

There is no way, then, with the stand-off weapon, of determining whether or not the silo is occupied or not.

You do not know, you have no feedback mechanism; you don't know, in fact, if the cruise missile made it to the target or not.

So, if your objective is to try to kill all of the missile silos in that particular field, you're going to have to expend a whole lot of ACMs to assure that you do that job, because of the smaller yields.

Now, I don't want to try to put down an ACM. What I am suggesting to you here, though, is that the combination of all these things play together.

There is not "a right answer" for all these things.

Senator LEVIN. My time is up.

Thank you, Mr. Chairman.

Senator EXON. Thank you, Senator Levin.

EYEING B-2 FUNDS

Mr. Welch, as I said in my opening statement, and you've heard quite a little bit about it this afternoon, there are people who have their eyes on the B-2 money.

What would be the impact on the B-2 program is there were no procurement funds for this year? Would it increase costs? Would there have to be personnel lay-offs at the contractor and the major subcontractor?

What would it do to disrupt the lower tiered vendors? How long would it take to rehire and retrain personnel and requalify the vendors?

Mr. WELCH. Well, I think you can conclude that, as far as cost and schedule, it is going to impact both of them significantly. I'd have to take the remainder.

But I think it would not be an over-statement to say that, effectively, you would have no program. You would have to go back and start over again and begin to build up. This is because you don't really plan a program, nor do you contract for it or put organizations in place unless there is some continuity to it.

So if you break the continuity, then you, in fact, create two programs. You have to finish one in the sense of looking at starting over again.

In my opinion, depending on how long the break was, we have already identified a potential of \$8.8 billion in the caveats that we have put into the present budget that we will deliver over here, and that's probably perishable certainly within a given year.

So, I would say that it goes up quite dramatically.

Senator EXON. Mr. Welch, I anticipated that answer. It was a lead-in to the second, followup question.

What would be the effect of lesser reductions than a total elimination? For example, what about if we were to come up with a budget of, say, half of what you have requested?

Mr. WELCH. Well, you know, each one of those would be speculative, if you changed the rate over any given year so you stretch it out.

I think that the team, as a whole, as an example, if you took all of the non-hands-on labor kind of thing, the overhead structure, it's about \$1 billion a year.

So, you start off with increments of \$1 billion. We have seen them going from a year's delay in the program that was presented in January to the one we're bring over here today.

We're going from \$67.7 billion to \$70.2 billion, and that's simply a year's delay.

So, we're talking multi-billions of dollars. We would have to answer any specifics for the record.

Senator EXON. What you're saying, then, Mr. Welch, is that given the constraints of the budget and the tough decisions that the Department of Defense had to make, you have streamlined this program about as far as it can be streamlined cost-wise?

Mr. WELCH. We believe that the program that we have presented today has addressed the questions on concurrency, has addressed the questions on appropriation rate of buildup, has addressed risk, both schedule and technical.

So, yes, sir, for the size of the program we have, it would cost you. It is not risk free, and one cannot guarantee those numbers.

But we believe that it's a program we'll stand behind.

PLUSH TYPE HANGARS FOR THE B-2

Senator EXON. I understand the Air Force wants to buy 120 individual climate controlled plush type hangars for the B-2 fleet. In this time on great budget austerity, how on earth can we justify this decision?

Mr. WELCH. Well, I'm not sure about the question of "plush type hangars." But I think that there have been trade-off studies that have been done, and I believe if we have not delivered them to the committee, we can show them to you.

We would propose to store our aircraft in alert-type shelters. This is a smart tradeoff. It's smart from the sense of snow and ice. It's smart from the work standpoint. It's smart from a cost avoidance standpoint.

So it is not a sense of something—we addressed it better here in the B-2 program. I think if we had the B-1 program to look at again, we could see the return on investment.

I would be happy to supply to the committee the analysis that was done.

Senator EXON. I wish you would, Mr. Welch, because there are some legitimate points. Once again, it would be nice to have.

[The information follows:]

B-2

The Air Force has determined that docking facilities are needed for effective B-2 fleet maintenance and operations activities. This involves altering existing facilities or constructing new ones to provide 120 docking spaces at the operational bases. These facilities will be constructed only to those standards required to meet operational and maintenance needs of the aircraft. Forty-eight of the 120 docking spaces are required, as would be the case to beddown any more conventional aircraft, to perform heavy maintenance, corrosion control, and fuel cell repair work. The remainder are required specifically by the B-2 primarily for maintenance of low observable components, fire protection, and environmental protection of alert and non-alert aircraft. Secondary benefits of docking the B-2 include physical security and safety.

Maintenance activities involving special coating and composite materials are critical to preservation of the B-2's stealth qualities. These special coatings and composite materials, which are applied during standard maintenance procedures, require controlled environments for proper curing and drying. Performance of these activities on open ramp areas, where environmental specifications may be impossible to meet, will considerably lengthen the time required to complete maintenance tasks and degrade overall maintenance quality. Without full docking capability, the addi-

tional time required for maintenance will significantly decrease availability of B-2 aircraft for operational and training missions.

Docks will significantly enhance aircraft protection from fire damage or loss. Fire protection systems to be installed in the docks are designed to completely cover the aircraft with extinguishing agents from above and below within 20 seconds of fire detection. Analysis of historical data pertaining to aircraft ground fires indicates that one or two B-2 bombers can be saved from catastrophic fire by parking in docks protected with fire suppression systems.

The environmental protection gained from docking the B-2 is critical to alert force response timing during winter icing and snow conditions. Traditional methods of ice and snow removal will degrade the B-2's low observable characteristics and cannot be used. Without docks, cumbersome climatic covers which must be installed on top of the aircraft will be very difficult to remove. Docking, however, will eliminate the need for both ice and snow removal procedures and the climatic covers. If docks are not provided, winter climatic conditions will seriously degrade the Air Force's capability to meet established alert force response timing requirements.

Environmental protection resulting from docking the B-2 will also extend the life of coatings and cockpit components. As with other types of paint, B-2 coatings are susceptible to long term damage from ultraviolet light. Docking will minimize these effects and effectively double coating life. In addition, docks will greatly reduce the extreme cockpit heat build-up which will occur during the summer months because the B-2 does not have openable windows. Controlling summertime cockpit temperatures will prevent premature aging and failure of avionics components. Minimize coating and cockpit component aging will reduce the time aircraft must spend in depot for refurbishing activities. This will result in increased aircraft availability at the operational locations.

Docks will provide physical security for the B-2 and its associated munitions. Docking reduces the potential for damage from small-arms fire and other acts of sabotage or vandalism. Docking will also provide visual security of classified components exposed during maintenance procedures.

Docks also provide an enhanced degree of personnel and equipment safety. When aircraft surfaces and pavements adjacent to the aircraft are maintained in an ice-free condition, the probability of accidents involving personnel, support equipment, or the aircraft is reduced.

Senator EXON. The major contractors that I have talked with indicate to me that the specifications that you required them to meet, and I think properly so, were to make these aircraft stealthy, even though they were not protected with hangars, let alone climate controlled hangars.

I just suggest that the program should be looked at.

My last question has to do with you, General Yates.

CONTINUED SLIPPAGE IN FIRST FLIGHT OF B-2

Let me begin by assuring you that I'm not trying to push the Air Force to go faster. But I think the committee deserves an explanation for the continued slippage in the date of the first flight of the B-2.

I'm not going to go through the scenarios except to say that when I was out in December and we saw that plane rolled out, we were not confidently predicting, but possibly predicting, a flight in February or March.

Well, here we are, and now it looks like it's going to be maybe 6 months beyond that time till we get to a first flight.

Now we're talking about vaguely June or July. It is now mid-June.

What are the causes for all of the slippages? Are they indicative of technical problems in the program of a serious nature which we did not earlier predict?

General YATES. Sir, they are not indicative of serious technology problems. There have been what I'll call minor technical problems.

A good example is that we had an environmental control system duct, the duct that carries cooling air, which separated under a proof test. That's a test you only do on the first airplane. It was about 150 percent of what the duct is ever expected to carry. The duct went loose at a point where it was not welded. It's not a quality problem. It's just that the design did not call for a weld.

When the duct let loose, it damaged other components in the airplane.

Now, that cost us in round numbers about a month of time.

We have had a number of things of that nature happen. None of them has to do with the technology which we are involved in on the B-2. They are technical problems.

But, as a direct answer, it's nothing fundamental.

At this point, we are past the point where those types of things I would expect to see. I'm not going to tell you that we can't have another unforeseen technical type of problem. But I think at this point we are more confident now to the system checkout, rather than to the large, mechanical issues. We are more confident every day, and we still think that the first part of July looks very good.

By the way, within a week or 10 days, that's pretty much been our projection for the last almost 2 months.

So we are getting more and more confident.

Senator EXON. Thank you.

My time is up.

Senator Cohen.

Senator COHEN. This is for either General Yates or Mr. Welch.

B-2'S CONVENTIONAL ROLE IN BOMBING MISSIONS

Recently I have seen more emphasis placed upon the B-2's potential for a conventional role in bombing missions.

I must say to the chairman that it sounds vaguely familiar. They're the same kind of arguments that were made when the B-1 was coming before Congress at that time.

Secretary Weinberger had testified that, what is frequently overlooked, is the fact that the B-1 will come to have a very important conventional role for many years to come.

I'm going to quote the chairman's words because they are very important. He had a colloquy with Secretary Weinberger.

Secretary Weinberger said, "We think that the much more likely scenario in the use of the B-1B will be a conventional plane. The B-1B, with its ability to carry cruise missiles and its ability to do all kinds of conventional missions, is an enormously useful plane."

The chairman said, "I presume the Stealth would be able to carry out most of those missions if it were operational."

Weinberger says, "It could. It would certainly not be the optimum or best use. It's like using the B-52 in Vietnam. It could be done, but it is not a very efficient use of resources."

So, what Weinberger seemed to be saying at that point was that you would not be using the B-2 in a conventional role, but the B-1B would have a conventional role.

The question I have is what is the likely scenario? The B-2 is strategic, and used primarily in a SIOP; directed rail-based SS-24s,

and the B-1 is for a conventional role plus perhaps some stand-off capability.

Tell me exactly what you have in mind.

Mr. WELCH. I think it is very difficult to look over a period of time. Each of these aircraft progresses from one point to another.

A B-1, B-2 and B-52 all are excellent platforms, and as excellent platforms with good radius payloads, they become very excellent weapon delivery items for conventional weapons.

So, the inherent capability is in each one of their platforms.

The decision, then, at a given time is are they going to be assigned to that role, vice assigned to the SIOPs.

As you know, some of the B-52s have been moved into the conventional role.

So, the opportunity is there. But the planning with respect to the numbers of aircraft required are effectively to support the SIOP deterrent mission.

But there should be nothing implied that says that the aircraft is not an excellent conventional weapon.

Senator COHEN. General Yates, do you think that we would be rising that kind of B-2 technology in, let's say, a mission over Libya? It was suggested recently that if we had used four B-2s in Libya, it would have been sufficient.

What if we had lost one B-2? Does that pose a problem for us in terms of countermeasures then being developed against the B-2?

Mr. WELCH. Let me make a general comment. At the Secret level, we need to be a little careful about this.

The answer is I'm not sure there's speculation about using one in that mode. I think people were simply illustrating the abilities of the aircraft, not necessarily saying that that would be a planner's decision on how to effectively use the airplane.

General Yates may want to comment.

Senator COHEN. Well, you can take any aircraft and use it in virtually any role. That's not the question.

The question is would you use it in a conventional role, given the amount of money that's involved, and given, number two, perhaps the limited utility in terms of its conventional mission and the risk of its possible destruction.

Would you weigh those risks in a conventional role? Would you save the B-2 for its primary mission, on the other hand?

Mr. WELCH. The B-2 is dedicated to its primary mission of support of the SIOP now. I believe somebody is simply speculating beyond the SIOP numbers and beyond some period of time that it could be applied in this role.

The aircraft that are being provided here are provided for SIOP and deterrence.

B-2A

Senator COHEN. Secretary Cheney's revised budget refers to the B-2A. Why is "B-2A" being used? Is there going to be a B-2B?

Mr. WELCH. There always will be, I'm sure, a cycle. Keep in mind that in the proposed budget also are the preplanned product improvement items of the order, I believe, of about \$3 billion worth.

I can only speculate. But that is planned in the A version of the model on a P³I basis.

Senator COHEN. But at this point, there are no plans for a B-2B?

Mr. WELCH. It's a standard designation that says that you start with an "A" I'm told. So it's not a B-2. It's a B-2A, just like we have a B-1A and a B-1B, an F-16A, and so on.

Senator COHEN. I'll have to go back to my classes in school that say you can't use an "A" unless you're going to use a "B". I just want to understand what's coming, that's all.

Mr. WELCH. Well, we could certainly look at one for you.

U.S. CERTIFICATION OF THE U.S. START POSITION

Senator COHEN. I think General Chain made a statement that said that any U.S. certification of the U.S. START position is critically dependent on the penetrating manned bomber and the Reykjavik counting rule.

What do you mean by "U.S. certification of the START position?"

Mr. WELCH. I don't believe I can address that without talking to General Chain.

Senator COHEN. I think that ought to be clarified because there is some implication that either SAC or the Air Force might not support a START Treaty unless the B-2 is included. I don't think they intend that. But the language says "any U.S. certification of the U.S. START position is critically dependent on the penetrating manned bomber and the Reykjavik counting rule" and that "the United States is to develop a militarily sufficient strike force, it must have the B-2."

When you put those two sentences together, it raises some questions about what that word "certification" means.

Mr. WELCH. Well, we all know about the Reykjavik counting rules, but beyond that I could not speculate.

We'd be happy to try to get an answer for you.

Senator COHEN. That would be helpful.

[The information was not provided by the witness in time for printing.]

Senator COHEN. That's all I have, Mr. Chairman.

Senator EXON. Thank you, Senator Cohen.

I believe that we are now probably prepared to move into the second part of our briefing.

Senator LEVIN. May I just ask a few more questions?

Senator EXON. Yes, go ahead, Senator Levin.

Senator LEVIN. I have just a couple of questions.

COMPARING KILL LIKELIHOOD OF B-1B AND B-2

The staff has done a little calculation on the kill likelihood of the B-1B with an Advanced Cruise Missile, compared to a B-2. They're both [deleted].

General YATES. Sir, one thing we did not talk about in this discussion a few moments ago is we are assuming that we'll have a B-2, which, hopefully, is a good assumption.

The other thing we have to think about is the restrictions that would be on us in a START environment.

Each bomber that we equip with cruise missiles counts as the number of cruise missiles it carries. That's why the penetrating bomber, with either 16 or in some cases more weapons, only counting as one, will be far more important to us under a START environment.

So, the structure of the targets in the Soviet Union are quite different from those in the United States. There are many, many more of them. They are more spread out. The penetrating bomber is going to become more important to us under START rules.

Senator LEVIN. Yes. But, you see, you are assuming a START agreement to make this argument, but you don't assume a START agreement to make the rail mobile MX argument. I mean if we have a START agreement that bans mobile ICBMs.

General YATES. Yes. But you can have a START agreement without banning mobile ICBMs.

Senator LEVIN. Yes, I know.

But our position is that there be a ban on mobiles. It seems to me that we are having it both ways.

Let me move on because I think the chairman wants to move to a different subject area. Let me ask a couple of other questions here.

COMPARING B-2 COSTS/THEN AND NOW

How does the cost of the B-2 compare now to what we projected it would cost a few years back, when we started out? Can you just give us two cost numbers? It is now said that it's going to cost half a billion-plus. What was the original cost in current dollars projected to be?

Mr. WELCH. Well, let's use base-year dollars because that is the only way we can get out of the situation.

Senator LEVIN. Okay, but just two numbers here.

Mr. WELCH. I'm not sure that it's possible to answer your question with two numbers, and I'm not being facetious here.

The content of the first program that I'll give you is not going to be the same as the content of the last program.

But the first numbers that you saw in the President's budget of 1986 I believe were \$32.3 billion.

Senator LEVIN. How much per plane would that have been?

Mr. WELCH. The same 132 airplanes. We'll just work it out.

Senator LEVIN. OK. Give us the total. Do it that way.

Mr. WELCH. We progressed, then, in 1988 to the \$36.6 billion; in 1990, to \$42.5 billion; and in the amended budget to \$43.8 billion.

Senator LEVIN. So it's gone from \$32 billion for the package to \$43 billion for the package, but it's a different package.

Mr. WELCH. A significantly different package, both in capability and schedule.

Senator LEVIN. OK.

But the dollars are the same-year dollars?

Mr. WELCH. Yes.

Those are all 1981 year dollars.

Senator LEVIN. Could you just give us, for the record, the improvements that have gone into that \$11 billion increase, which is about a 33 percent increase?

Mr. WELCH. Yes.

[The information follows:]

B-2

Total program cost is \$70.2 billion in then year dollars which is an increase of 11 billion dollars. Approximately one-half of the increase is due to production schedule changes. The schedule was changed to reduce budgetary pressure and to reduce program concurrency and cost risk. The remaining increase is from RDT&E. The increase in RDT&E is primarily attributed to three factors. First, the contractor has experienced problems in production of the development aircraft. The problem was caused by late engineering drawings which resulted in labor inefficiencies, parts shortages, and initial quality problems associated with learning. Second, the cost of materials for production was greater than anticipated. Finally, the cost and schedule impact of the 1983/84 major was underestimated.

FOOTING BILL FOR FLAWS IN THE B-1

Senator LEVIN. Finally, on the B-1 issue, you are proposing that the taxpayers foot the bill for fixing the flaws in the B-1. I am still having problems with Eaton being left off the hook on that because I don't know why we accepted delivery of systems that we knew were defective, so that we did leave them off the hook.

My question is this. Why should the taxpayer and not Eaton pay for that off-the-shelf receiver which you want to buy to fix the B-1?

General YATES. I think we have a fundamental choice to make here.

We think we are making the right choice in order to fix the B-1, and right in terms of what the taxpayers' liabilities are.

First, you are right on the original contract. The Government's liability was open-ended. That is a thing of the past. It is no longer the case. The new contract definitely limits the Government's liability.

Senator LEVIN. To what?

Is that a \$400 million cap?

General YATES. The ceiling price of the contract is \$3.9 billion. That's not new work that has to be done. But, nevertheless, the contract has a ceiling, and that is the cap of the Government's side.

[Information provided subsequent to the hearing.]

We expect to complete the efforts at the target price which is lower than the ceiling.

Senator LEVIN. Is that \$400 million cap still in place?

Mr. WELCH. Senator Levin, while he is checking the answer to that question, I would like to suggest that letting Eaton off the hook for not delivering that part of the capability is not planned.

There is a consideration. Whether that consideration matches with the cost of the radar warning receiver is a separate question.

General YATES. There is no \$400 million cap. The total Government liability at a total program ceiling cost of \$3.9 billion.

Senator LEVIN. But there was at one point.

General YATES. I am saying, Senator, that I am trying to agree with you that I didn't like the contract that we used to have. We don't have that contract anymore.

Senator LEVIN. As I understand it, there was an agreement that was entered into in April 1988. Eaton agreed to perform a number of repairs. The parties had an absolute ceiling of about \$400 million. Eaton was going to pay for any amount above that ceiling.

Is that now no longer in existence, that agreement?

General YATES. I cannot relate to \$400 million.

Senator LEVIN. There was no agreement with Eaton in April 1988.

General YATES. Here is what I think the \$400 million number is.

When we went to the global contract, we bumped the target ceiling on the contract up about \$400 million. We don't talk in those terms because the total contract value at ceiling is about \$3.9 billion. So there was a bump of about \$400 million.

Senator LEVIN. And Eaton was responsible above that number?

General YATES. That's right.

Senator LEVIN. Are they still?

General YATES. Yes, sir.

Senator EXON. We are going to get into that more in the second part of this briefing.

Senator LEVIN. Thank you.

Senator EXON. Thank you, Senator Levin.

Senator Warner.

Senator WARNER. Thank you, Mr. Chairman, I appreciate the opportunity to be here and I want to ask some questions. I will make a little speech first, and then will ask questions.

I was interested the other day with the chairman to go back into the history of the Senate. There are only 22 Members of the Senate left who were in World War II—you and I and some others.

But I guess the sooner we get rid of us around here, the better off we are, because we have lingering memories.

I remember when I first reported to aviation training, which I was in for a brief period during World War II.

The older aviation cadets took the younger ones back to the "bone yard."

Do you remember what the "bone yard" was?

General YATES. Yes, sir.

Senator WARNER. Well, you never saw such a collection of crashed and busted up airplanes. It scared the hell out of all of us youngsters coming in.

But it was almost a point of pride if you'd busted one up and survived, and went on into your cadet training.

I raise that issue as I look at this B-2.

I think we racked up something like 20,000 airplanes in the training command in World War II. Now, given there were a lot of extenuating circumstances during that period.

But we cannot even begin to accept those types of losses with the B-1 and the B-2.

So I would like to have you at some point, when I finish rattling away here, address how you hope to obviate that problem, particularly with the B-2.

[Information requested follows:]

B-2 SAFETY

The Air Force has dramatically improved its aircraft safety record since the end of World War II. Today, the Air Force is averaging less than one fighter type aircraft loss per month, while the loss rate experienced in larger, multi-engine aircraft has been reduced to less than one every couple of years. However, the Air Force goal is to reduce the accident rate to zero.

This dramatic reduction in aircraft accidents has been brought about by an aggressive accident prevention and education program. This involves both man and machine. As for the machine, the B-2 can be used as an example.

Accident prevention starts in the design process. At Northrop, a select group of engineers, assigned to the safety organization and reporting directly to top management, reviews B-2 airframe and subsystem designs so that potential hazards can be identified and designed out. The design of critical subsystems includes the use of redundancy to limit the impact of a failure of a component. There is also an active Failure Modes and Reliability testing program. The airframe and subsystem are tested to destruction and/or several life times of wear to determine if there are problems with the design or parts reliability. Finally, one of the critical objectives of the combined DT&E/IOT&E and OT&E test program is to verify the safety of the aircraft through actual inflight training.

Senator WARNER. Over the weekend, I was with a member of my family. Several of them are fliers. They brought to my attention an article in the AOPA pilot magazine of May 1989, which described one of the November 17 B-1 losses.

The final paragraph reads:

The accident report cited the aircraft commander with the failure to safely execute an instrument approach in that he allowed the aircraft to descend below the published minimum descent altitude. The commander also was faulted for failure to establish sufficient visual cues to determine the runway environment before departing from the published MDA. The pilot was faulted for failing to effectively monitor the approach in that he failed to advise the commander of the deviation from the MDA without establishing the landing environment.

There it is, human error, young people driving these machines. It's the same problem we had in World War II. It's the same problem we've had all along.

In the past fiscal year, I don't have the exact figures, but each of the services came in and described their operational losses. I think there were 50 to 70 in the various services.

Well, we can't accept that type of loss in these two aircraft programs. Yet how do we obviate it.

Mr. Chairman, first I would ask unanimous consent that I put this article into the record.

Senator EXON. Without objection, it is so ordered.

[The information follows:]

RETROSPECTIVE

(By Mark R. Twombly)

The four-man crew of Kiska 51—the call sign of B-1B serial number 85-0076, assigned to the Strategic Air Command's 28th Bombardment Wing at Ellsworth Air Force Base in South Dakota—had been anticipating a long training mission. The plan was to conduct low-level navigation on an IFR military training route enroute to a radar bombing range, followed by air-to-air refueling with another B-1B and a tanker, and finally, practice approaches back at Ellsworth. The 6.4-hour flight was to begin in the evening; the crew would not land until after midnight.

The plan began to unravel when bad weather moved in. Winds from a slow-moving storm in northeastern Colorado combined with a high pressure system over the United States/Canadian border to produce a northerly to northeasterly surface flow across the Dakotas. The low-level winds spawned low clouds, precipitation, and fog as they swept over the rising terrain. Moderate rime ice was forecast along the military training route, IR 320, and the air refueling track, 14 Bravo East. The Ellsworth forecast called for 1,000 scattered, 3,000 broken, 7,000 overcast, visibility seven miles in light snow.

The commander assigned to the mission was not going to be available for the planning session the day before the flight was scheduled, so he was replaced. The new commander, as well as the defensive systems operator, were instructors and check pilots. At the planning session, however, they assured the pilot and offensive

systems operator that the mission would be instructional and not a check ride. None of the four officers normally crewed together.

The pilot would later tell USAF investigators that the aircraft commander had a reputation for being a very demanding, meticulous, by-the-book pilot, but that during the briefing the commander urged the rest of the crew repeatedly to call out any mistakes he might make rather than let him miss an error. The pilot speculated it was the commander's way of putting the crew more at ease.

The next afternoon, the crew met for a pre-flight briefing. Based on the weather report and forecasts, and a two-hour delay in the availability of the airplane due to a maintenance squawk, the original mission was scrubbed and an alternate plan devised. The refueling exercise was changed to a different location, and the bombing run was changed to high-altitude electronic countermeasures simulation.

Just before takeoff and again at rotation, the pilot alerted the commander that the ice warning annunciator was on. The commander responded that they were committed to the takeoff, and continued. The incident came up during the accident investigation. The pilot told investigators that he felt the commander had in effect told him to "sit there and be the copilot," so he did not press the issue.

Kiska 51 entered a 1,000-foot-thick overcast at about 700 feet agl and a higher layer at about 18,000 feet, but was clear of clouds at FL270. The ECM run was routine, but as the B-1B proceeded to the refueling rendezvous the crew was informed that the tanker had to cancel the mission and return to base because of a mechanical problem. The tanker reported worsening weather at Ellsworth. Kiska 51's commander requested an early landing.

The pilot flew the descent while the aircraft commander completed the descent check list, including a briefing of the procedures for the ILS localizer approach to Runway 13. B-1B crews are prohibited from flying precision ILS approaches because of problems with the steering presentation generated by the flight director computer. An Air Force directive limits ILS approaches in the B-1B to localizer minimums.

During the descent, Ellsworth controllers switched the active runway to 31. The aircraft commander reviewed the procedures for a localizer approach, which has a minimum descent altitude of 3,660 feet msl (467 feet agl), and took over the controls. The pilot was to look outside for visual landing cues. At the missed approach point, the pilot reported seeing an approach light, but the commander had already initiated a go-around.

Runway 31 at Ellsworth is served by ILS and tacan approaches. The MDA for the tacan approach is 180 feet lower than the ILS localizer minimum. The tacan final approach course, however, is offset eight degrees from the runway heading. After missing on the localizer approach, Kiska 51's commander asked for the tacan approach.

Another B-1B was cleared for the approach ahead of Kiska 51. The crew completed the landing and reported to the tower that they broke out of the overcast right at minimums. With the aircraft commander flying, Kiska 51 descended to the MDA.

The pilot expected to see some visual cues because the B-1B ahead of them had broken out at minimums and landed. One of the back-seat crewmembers called out "Altitude" to alert the commander that the airplane had descended below MDA. The pilot checked his altimeter, which showed a 30-foot deviation and a 200- to 300-fpm rate of descent. At that point power was added to arrest the descent. The vertical velocity indicator showed a 200- to 300-fpm climb, and the altimeter started upward, according to the pilot, who then looked back out the window.

The offensive systems operator said later that the commander reported not seeing the runway lights. The pilot said, "I have them," and almost immediately the commander responded, "Okay, yea, I see them now."

According to Air Force investigators, an analysis of pressure altitude, and radar altitude data showed that the B-1B leveled at the MDA 19 seconds before the crash. For the next five seconds it remained level or in a slight descent, then began an uninterrupted descent for seven seconds.

The right wing struck three 14-inch-diameter poles extending 56 to 58 feet above the ground 2,900 feet short of the Runway 31 threshold. After hitting the poles, the B-1B's electronic countermeasures antenna caught and severed a high-voltage power line. The number-three engine then struck an approach light stanchion. The airplane struck the ground in a 100-degree right bank, 18 degrees nose low, 1,200 feet short of the runway. Explosions and fire consumed the wreckage.

All four crewmembers were ejected from the airplane. The ejection sequence had to be initiated by either the commander or the pilot, but it could not be determined who was responsible. Ejection was initiated about one second after the first impact with a pole. The pilot and offensive systems operator escaped injury. The defensive

systems operator suffered a nonparalyzing spinal injury. The commander sustained a concussion and knee injury.

The accident report cited the aircraft commander with failure to safely execute an instrument approach in that he allowed the aircraft to descend below the published minimum descent altitude. The commander also was faulted for failure to establish sufficient visual cues to determine the runway environment before departing the published MDA. The pilot was faulted for failure to effectively monitor the approach in that he failed to advise the commander of the deviation from MDA without establishing the landing environment.

The cost of the destroyed B-1B, including engines, electronics, and modifications, minus research and development costs, was \$216.6 million.

ACCURACY OR INACCURACY OF THE ARTICLE

Senator WARNER. I would like to ask the General to write to the committee to comment on the accuracy or the inaccuracy of the article, because this is what is being read by the general aviation group, and they are coming to me with questions such as how in the hell can we afford these two airplanes when you have the same type of human error that apparently is prevalent in all types of aviation. We cannot accept the losses in terms of the values of these airplanes that we can with a smaller one, or that I suppose you can there.

So, how do you propose to train this generation of aircraft pilots, commander and crew, in a way that is different so as to avoid the type of operational losses that we have experienced throughout the history of military aviation?

SIMULATORS

General YATES. Senator, first I can give you answers which are obvious, and tell you that we're going to do everything that we know and that we have learned through all these generations of people to improve training.

Many of the dollars that we ask the Congress to give us are, in fact, just to obviate those problems, in terms of simulators, simulators which no one could even envision just a few years ago.

Senator WARNER. Well, I have to believe that all these folks who committed these human errors have been on simulators.

General YATES. They have. They have.

But also I have to tell you that, while there was pilot error accident, there are things that we can do better in the B-1 as far as the instrument presentation is concerned, and we have done that, essentially. Those changes are starting to retrofit next month and will be done before the end of the year.

The pilot training with the support of the Congress, as you know from your background, is such that we must continue to keep the guys flying. I mentioned simulators. Then there is the presentation.

Computers today offer us training methods that people just never dreamed of. And, in fact, we're taking advantage of all of those. It's unlike your experience.

Senator WARNER. For the record, I never completed aviation training. The war was coming to a conclusion and they put me into another program. I always wished I had finished it. But I sort of hung around aviators a good deal during World War II, and then

when I went back into the Marines in Korea, I did sit in the rear seat, occasionally. So I know a little bit about it, but just a little.

I just do recall those tragic numbers of accidents that we had during those periods in the training command. We're still experiencing them today.

The aviators are the same young, courageous individuals that they were in those days. The thing that's changed is the cost of these airplanes.

We were able to survive these losses during previous periods because of the relatively inexpensive nature of the airplane. But when you get to a half billion dollars, you've got everybody's attention, and the aviation community that speaks to me as I travel around say that we are crazy as hell as a country to start putting that kind of money into these aircraft.

General YATES. If you will allow me——

Senator WARNER. Oh, I will allow you all right. I just had to get that off my chest.

General YATES [continuing]. I don't think the numbers are accurate, but I think they are fairly close.

I think you understated the problem.

If I remember right, in 1943, within the continental limits of the United States, the U.S. Army Air Corps lost 20,400 airplanes, about 57 a day.

If you look at even in 1956, which was a noncombat year for the U.S. Air Force, F-86Fs, which were air-to-air and air-to-ground, we lost more than one a day—about 380.

Nowadays, with F-16s, the same airplanes doing the same job, but under much tougher conditions, doing it at night, where we never flew F-86s at night, doing it all-weather, in round numbers, we lost about one a month, or about 12 a year.

We have lost three B-1s since 1987. That's about one a year.

We need to do better than that. That is clearly the most hazardous time of the airplane's life. It's the time when we know the least about the systems and the pilots know the least about the airplane characteristics.

So we are reducing accidents by several orders of magnitude, and I expect that favorable trend to continue.

Senator WARNER. But the cost of these aircraft has gone up by twice that several orders of magnitude.

It is our joint responsibility here. I sat in that seat (indicating) for 4 years while we developed the B-2, and listened to all of the cost projections. So I am not dumping in your lap. I share my part of the responsibility.

We may just have thrust upon you, the Department of the Air Force, an impossible situation with the cost of this aircraft.

I have to leave, Mr. Chairman. I'm sorry.

I thank you for your responses, and if you wish, please amplify them for the record.

I would very much appreciate the earliest possible response to my question about this article.

I thank the Chair.

[The information was not provided by the witness in time for printing.]

Senator EXON. Thank you, Senator Warner.

Gentlemen, let's proceed into the second half of the presentation and let's move along as quickly as we can.

ADVANCED CRUISE MISSILE

Mr. WELCH. As for the Advanced Cruise Missile, we have a series of charts before you which we will walk through.

This is not a new program. You pointed out in your opening statement that we have had our difficulties over the years.

I would propose, because of time, that we simply start with chart number 3.

ADVANCED CRUISE MISSILE (AGM-129A)

OBJECTIVE

ENHANCE THE LONG TERM EFFECTIVENESS OF THE BOMBER LEG OF THE TRIAD BY DEPLOYING AN ADVANCED CRUISE MISSILE CAPABLE OF DEFEATING PROJECTED SOVIET DEFENSES THRU THE 1990s

- * GREATER RANGE
- * IMPROVED SURVIVABILITY
- * ENHANCED OPERATIONAL FLEXIBILITY
- * INCREASED ACCURACY
- * MAXIMUM COMPATIBILITY WITH OTHER STRATEGIC SYSTEMS

3

The idea for an Advanced Cruise Missile really was greater range, improved survivability, the operational flexibility, accuracy and compatibility. These are all significant points, and they are all measured in factors of two, three or four improvement.

So I would say to you that the reason for going with the program is still valid. The performance we should be able to deliver from the vehicle is still valid.

[Chart 4 deleted.]

I think that chart 4 would illustrate for you the idea of being able to improve the standoff distance with the ACM, which gives us the opportunity for a single B-52H to attack Vladivostok or Moscow and come back unrefueled.

So the value of range and the value of stand-off range is still very significant to us. It is something we very much want.

[Chart 5 deleted.]

If you look at chart 5, I think it is easy to compare the changes, as we went from air launched cruise missile to the Advanced

Cruise Missile. Although the range has improved somewhat, the operational range, which is the stand-off range, contributes to the stand-off. You can see for ops planning we have been able to improve that from [deleted]. And that performance has been demonstrated.

Simply running down each one of the cases, there is a step improvement and a reason to begin to bring the ACM on behind the ALCM.

[Chart 6 deleted.]

On chart 6, the schedule shows really that there are eight flights remaining to complete the full-scale development program.

That full-scale development will end in calendar year 1990.

[Chart 7 deleted.]

Moving to chart 7, it will show that of the congressionally mandated six successes, we have had [deleted].

So it is our intent to meet the six successful flights with a goal of being finished by [deleted]. That would then permit us, if you go to chart 8, on flight testing, to complete the remaining full-scale development flights.

[Chart 8 deleted.]

You will note over there in [deleted]. You will recall we were directed to bring a second source aboard.

I don't want to return to the chart, but about roughly \$100 million has been invested in that second source. We have been through tech transfer in the qualification phase, and these [deleted] essentially complete the qualification.

Then we would have a year or so of split production in a designated sense, [deleted] head-to-head competition in 1993, and beyond.

[Chart 9 deleted.]

Chart 9 just details out the funding that we're asking for this year.

This funding is essentially the same as came over in the original budget. So we're not bringing any new budget figures in. Fiscal year 1990 RDT&E previously was \$81.7 billion, and you see it's \$79 billion.

So it is an unchanged program, financially schedulewise, than you have seen since the original budget submission.

I think a key point is that the ACM is the vehicle of choice for [deleted] as shown on chart 10.

[Chart 10 deleted.]

The idea there is [deleted].

[Chart 11 deleted.]

If you turn to chart 11, you can see that we have tried to show the changes, on the top, and the things that are unchanged. Simply, when we [deleted].

But still, as far as the targets assigned [deleted].

[Chart 12 deleted.]

We must also [deleted] shown on chart 12. There is a [deleted]. Those test programs must be completed.

[Chart 13 deleted.]

I think this may refer back to some of the discussion that General Yates and Senator Levin were having. On chart 13, you can see that [deleted].

Just a point of note, even though I have shown 13.7 megatons there, the largest weapon in our inventory is [deleted]. So we can't even really reach to those levels.

[Chart 14 deleted.]

Chart 14 simply summarizes and I think is self-explanatory. If you want to look at the increases or decreases, as to what the case may be, in terms of the reductions in some of the observables, and the improvement in range, both stand-off and operational, and the improvement in terminal accuracy, and also the flexibility within mission planning.

Finally, the real issue here is that we must really finish up obviously the six successful flights and we will have expiring funds in fiscal year 1987 of \$192 million if we do not finish up and get obligated.

So we believe that we can work the procurement if we get the six successful flights by next month. But should we have a difficulty going on that, we need to watch those expiring funds.

The full-rate production we think has been deferred appropriately now to fiscal year 1992.

A point to make is that we have, in fact, deferred the flight test of this missile on the B-1 to occur when the need for the ACM on the B-1 occurs, so as not to contaminate the B-1 as a missile carrier, depending on the counting rule outcome.

That is an update, Mr. Chairman, on where the ACM program stands.

We'd be happy to answer any questions.

Senator EXON. Thank you very much.

Do you have anything to say in this area, General?

General YATES. No, sir. I don't have anything to add to this.

Senator EXON. Jack, let's go on to everything else and then we'll get to our questions.

Mr. WELCH. Very well.

General YATES. Then, Mr. Chairman, I do have something else here.

Senator EXON. If we stop now and ask questions on only this program, we'll not finish here till 5 o'clock.

Mr. WELCH. What would you prefer to be the next order of business?

Senator EXON. Any way you see fit.

General YATES. I will work on the B-1B. We have already discussed this quite a bit.

B-1B PROGRAM STATUS

Sir, in that same package of charts, the next chart is the introduction chart. It is chart number 16.

This is the B-1B program status.

CHART 17

ISSUES

B-1B defensive avionics system:

"CORE" ALQ-161A.

Radar warning receiver.

B-1B capabilities

Fiscal resources:

Baseline status.
Non-baseline investment.

Chart number 17 is simply just the issues that I'm going to cover. I'm going to talk first about the ECM system. Everybody wants to talk about that, and I'm going to try to put that into some perspective, the total capabilities of the airplane. Then I'll talk about the fiscal resources required. And, as I go through that, I'll be happy to tell you what I know about the "M" account

CHART 18

B-1B DEFENSIVE AVIONICS

"CORE" ALQ-161A

"CORE" required for consistent/supportable performance:

[Deleted.]

"CORE" development progressing:

Initial flight test April 1989.

Initial S/W release June 1989.

TWF FCA/PCA June 1989.

System level PDR June 1989.

TWF deploy July 1989-December 1990.

Anechoic chamber July 1989.

Final S/W release May 1991.

Chart 18 talks about the fundamentals of what we're trying to do with the ECM system.

Now, we did find out about a year ago, after we had this global contract with Eaton that Senator Levin brought up earlier, that, in fact, we had a fundamentally flawed architecture, and we needed to go back and change that.

Our plan is to have the Eaton system and develop what we call the "core." We need that, as the chart says, for consistency, and that means that every time we face a threat, we want the ECM system to give us the same result and supportable performance.

Now, "supportable" means that all the airplanes need to be in the same configuration. They need to have reliable operation, proper diagnostics, and adequate support equipment.

That's what we're after.

It is important, too, to remember that the [deleted]. So it works against any missile that is coming at the airplane, whether that missile is from a SAM or from a fighter airplane. It's a very effective system.

The core will give us the capability [deleted].

There are other threats, which we refer to as the "bottom 39"—since we call the first group the "top 11"—[deleted].

We need to know about all of these. One of the problems we have, the limitations, with the core system, is that [deleted].

In order not to do that and still [deleted] we need to augment the system with a radar warning receiver.

Our proposal is to buy an off-the-shelf, no development, an off-the-shelf radar warning receiver and integrate that into the B-1.

The core development program is progressing very nicely. The initial flight tests which would bring on those diagnostics that I mentioned earlier reprioritize the threats and enable us to deal with those and put in those consistency fixes which I mentioned

earlier. Those flight tests were completed in April. The initial software release is going to occur this month, on schedule.

We had completed the work, the development work, on the tail warning function. The flight test had been done. The tail warning system came up and detected [deleted] the missiles that were being fired at the airplane and automatically dispensed countermeasures against those.

We've done the modification kit testing already for that tail warning function. We will start retrofitting the B-1s in July. We'll be through by December of 1990.

The final software release with all the fixes that we know of to bring the core up to speed will be in May of 1991.

CHART 19

B-1B DEFENSIVE AVIONICS RADAR WARNING RECEIVER (ALR-56M)

Install Air Force common RWR:

Added to ALQ-161A "CORE" program.

Satisfies situational awareness requirement.

Risk reduction underway:

Installation studies.

Antenna pattern measurements.

Installed performance will be defined.

B-1B RWR integration.

I would ask you to turn to the next slide, which is slide number 19. I want just briefly again to mention this radar warning receiver. I have told you what it did. It provides situational awareness.

The main thing you want to do with these threats is not to fly over them and challenge them. The main thing you want to do is to see them and avoid them. This is what allows us to do that for the whole panoply of threats that we will face.

There are risk reduction studies underway, and those risk reduction studies will tell us what the installed performance will be.

Again, I want to emphasize there is not a radar warning receiver development. We are integrating it into the airplane. By the way, it will not be integrated with the jamming so that you get automatic jamming when you detect something on that new radar warning receiver. That's what the core does for those [deleted]. It's not what the radar warning receiver does.

You will see the threats. Then you will either have to decide to manually jam them or avoid them.

I want to try to put this into some perspective because I think a lot of that has been lacking.

[Chart 20 deleted.]

Slide number 20 shows the B-1B penetration capabilities. B-1B penetration capability is a function of all of the things I have listed here: low-altitude automatic terrain-following—and I have a slide on that next, so I will defer comments on that for now; high speed at low altitude—this is a .85 MACH airplane. At 200 feet, it is extremely difficult to detect and intercept by anybody's standards, today and throughout the rest of the century.

The nav system is doing better than we originally anticipated. The nav system is within a quarter of a mile drift per hour.

The B-1 has a low radar cross-section. If you look at the head-on approach, like a fighter would have to take with this airplane, with

a look-down of 10 degrees, the radar cross-section is less than [deleted].

I have another chart on intercontinental range because it has been much discussed. At this point I will simply say that across the board we meet all the specifications for all SIOP mission loads for the B-1.

It is an extremely accurate bomber. It just won the SAC bombing competition for low altitude bombs and for the SRAM accuracy.

I have talked about electronic countermeasures. They are limited today. We do need both the core and the radar warning receiver to have a capability against the [deleted].

When we get that, the B-1B penetrativity will be within 10 percent of the original projections that we made for the B-1 way back when.

CHART 21

B-1B TERRAIN FOLLOWING

Current performance—excellent:

Automatic hands-off.

200 feet.

Mountainous terrain.

Day or night.

Hard ride.

Fly-up rate:

Requirement—less than 1 every 15 minutes.

Current rate—less than 1 every 80 minutes.

Rare/unusual terrain testing—70 percent complete:

Deep snow.

Sand dunes.

In the next slide, slide 21, I want to talk about the terrain following system because there has been a lot of bad press in the last year or so. One indication that something must be doing okay is if you don't read much about it in the press anymore. It is, in fact, doing very well.

It is automatic, hands-off; 200 feet, mountainous terrain; day or night; hard ride. The fly-up requirement was supposed to be less than one every 15 minutes. The false fly-ups are less than one every 80 minutes.

By the way, this thing operates with the ECM system operating. That was a concern in the press a few months ago.

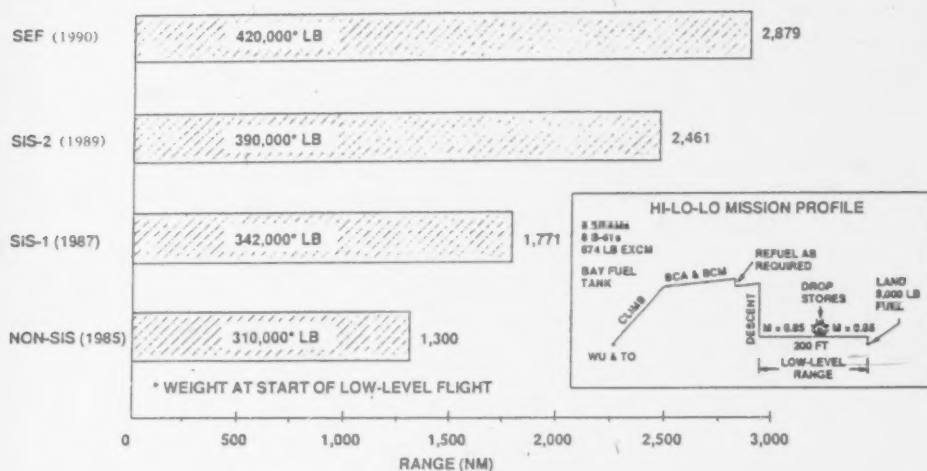
There are no restrictions on operating the terrain following system and ECM. They have all been lifted.

The only testing that remains is some rare conditions. There are some very rare deep snow conditions. We're not talking about 3 or 4 feet of snow, or we're not talking about the snow that we normally see in the Rocky Mountains. But there are some unusual cases—if you get 20 or 30 feet of snow on a mountain ridge, where we need to fly against those conditions and make sure that we have the right performance. Then there are some sand dunes in some places of the world which have some unusual radar-absorbing properties that we have to fly against.

That is all that's left to be done. So the system is working very well.

Chart 22

B-1B LOW-LEVEL RANGE CAPABILITY (BASED ON FLIGHT TEST DATA)



If you would turn to slide 22, I'm going to talk about range capabilities.

Now, I don't want to make this more complex, but it is important to be sure you understand it.

By the way, the ranges you should see here are just the low level part of the profile. There is a complete profile on the bottom part of your slide. We are talking about just the low-level part.

When we "spec" the airplane, we said when you're flying the airplane manually, you ought to be able to fly 1,500 nautical miles at low altitude. Now, we said 1,000 of that should be at .85 MACH; 500 miles of that ought to be at .55 MACH.

Now that's the spec.

What's important to us is the way we're actually going to fly this airplane. It's not like that. We're going to actually fly at .85 MACH, and we're going to fly it with the automatic terrain system.

The reason that is important is that in worst case, you could have an automatic terrain demand that you pull 2.4 "Gs" for 10 seconds, and we have to be able to do that without pulling the airplane into "stall warning."

This is critical because those are the things that we have been working on in the last few years.

So, it's much more demanding, the way we actually fly from the way the airplane was originally "spec'd."

So what I'm going to talk about here is the way that we will actually fly. Those are these ranges.

We have always been able to fly the airplane and get a range of 1,300 nautical miles because, again, that starting weight of 310,000 pounds is limited by that 2.4 "G" pull into the stall warning.

You can see that as of today, the airplane is able to fly almost 1,800 nautical miles at low altitude. As of August, when we had the tech orders in the field, that will go up to 2,500 nautical miles, about double what the original specification was.

A year from now, we've already completed the testing on what we call "stability enhancement function," and we'll be out to almost 3,000 nautical miles.

Senator GLENN. Mr. Chairman.

Senator EXON. Senator Glenn.

Senator GLENN. Before you leave that slide, I have one question. Your 2.2 "G" stall, what is that—a max gross, or what?

General YATES. Senator Glenn, you have to be able to pull 2.4 "G"s for 10 seconds without getting a stall warning.

The point is you've got the right words. At this gross weight that I depict here—in other words, the starting gross weight, we're taking worst case. We say you've just refueled the airplane; it goes down to low altitude and immediately gets the worst case, okay, for the 2.4 "G" pull. Could you make it?

What we're saying is that as of today, you could not have a gross weight greater than 342,000 pounds.

Senator GLENN. But you're talking about your 2.2 on an automatic pitch-up?

General YATES. Correct.

Senator GLENN. Well, that is not a big problem, is it?

General YATES. It has been.

Senator GLENN. If you were going to hold the Gs for 10 seconds, you'd be kicking the terrain following off well before that if it's on automatic pitch-up, wouldn't you?

General YATES. The terrain-following system, those are the max limits on the terrain-following system. It can demand 2.4 "Gs" for 10 seconds.

Senator GLENN. If you left it on. But you're going along, you're riding along, and all at once you get a glitch, and the aircraft pitches up. You're not going to leave it on there for 10 seconds.

General YATES. No, sir, not with a glitch.

Let's say you were going down a slope, and there is a cliff over here, okay (indicating). So, as you come down, in order to clear that next terrain—it's not a glitch now—the system should give you enough warning so you'll never have to do more than pull 2.4 "Gs" in order to clear that upcoming cliff.

So it is a legitimate demand on the system, but it is worst case.

Senator GLENN. That is worst case. You ought to look at your world aeronautical chart before you start going down at a place where you have a cliff like that there.

General YATES. Well, you know, combat conditions in the Soviet Union are such that you can't follow a chart.

Senator GLENN. Yes, I understand.

Chart 23

B-1B FISCAL RESOURCES FY 90-94

- o B-1B BASELINE COST ESTIMATE - \$20.88 B (FY 81 \$)
- "CORE" WITHIN \$20.5 B CAP

- o NEW FYDP BUDGET AUTHORITY REQUIRED - \$739 M

	<u>FY 90</u>	<u>FY 91</u>	<u>TOTAL</u>
RWR	46	70	489
SUPPORT EQUIPMENT	<u>10</u>	<u>10</u>	<u>250</u>
TOTAL	\$56 M	\$80 M	\$739 M

- o NON-BASELINE FYDP INVESTMENT REQUIRED - \$687 M

	<u>FY 90</u>	<u>FY 91</u>	<u>TOTAL</u>
ADDED CAPABILITIES	34	63	485
MODIFICATIONS	<u>52</u>	<u>61</u>	<u>202</u>
TOTAL	\$86 M	\$124 M	\$687 M

- o TOTAL B-1B FYDP INVESTMENT - \$1.43 B

General YATES. Chart 23 talks about the dollars that it takes for us to do this.

Now, what we are saying is that the B-1B cost estimate would go above, to do this entire scheme, it goes above the \$20.5 billion cap.

Within the \$20.5 billion cap—and I think this is important to remember—we do all of that core work with Eaton that I described earlier on the ECM system. What drives us above the \$20.5 billion is to complete the depot work or to add the radar warning receiver. That drives us up to \$20.88 billion. It is within 2 percent of the \$20.5 billion that we said we would do some years ago.

What that requires in new budget authority is \$739 million.

\$489 million of that is for the radar warning receiver; \$250 million is for the depot support equipment.

There are some other things that we want to do to the airplane, which are improvements, which are not included within the cap.

We want to integrate the SRAM II, which I'll talk about in a minute, and we would start buying kits for that in 1990 and 1991.

We want to put some advanced expendibles. We want to start the research and development for some advanced expendibles on the airplane.

Now, those things are not within the cap. So, the total investment across the FYDP would be \$1.43 billion—not \$7 billion to \$8 billion as the GAO has talked about. And if I include the total outside the FYDP, it's another \$320 million.

So the total of everything we know of today to do to the B-1 is \$1.76 billion, not \$7 billion or \$8 billion.

CHART 24

B-1B BASELINE COMPLETION—CONGRESSIONAL ACTIONS REQUIRED

Approve/fund the deferred depot equipment and radar warning receiver programs.

Provide statutory relief for the \$20.5B (FY 81 \$) B-1B cap.

Sir, the last chart is the last chart in the B-1 section, chart 24.

What we need is the new funding to do the deferred depot support equipment and the RWR, and we are asking the Congress for statutory relief from the \$2.5 billion up to the \$20.88 billion number.

Sir, that is all I have on the B-1B. I can go right into the SRAM II at this point.

Senator EXON. Then let's go ahead.

General YATES. Okay.

Senator GLENN. May I ask one question first before we go on?

Senator EXON. Yes.

Senator GLENN. When you say "core," it implies that you may have a whole gaggle of things here. I have been a little concerned about this.

Are there other ECM problems that you see out there right now?

I think this is about the third plan to fix the ECM that we've had now?

General YATES. I would call this the "last."

Senator GLENN. Well, yes, but we thought the others were the last, too, with all due respect.

Do we really have a handle on this problem now, that we really think we're over the hump? This is the third or fourth fix that we have had that was supposed to get us out of the woods.

You talk about a core program. That indicates to me that there is more than one in there. Are there other things that we are not aware of yet?

General YATES. No, sir, there are not. We are telling you everything that exists. We are much more confident about this now, because I went through this little litany of where we are in terms of testing.

One of the problems we had before is we were giving you our best information, but the point was that we were not very far into testing. As we got into the testing, we found problems that we did not know about.

Now, we feel very good because we are further along in the testing, and it is, in fact, on schedule. We have done the release. So, basically, Senator Glenn, as of today, we have already tested and have ready for release about 80 percent of everything that is in the core.

Senator GLENN. As you see it now, will there be any additional ECM fixes after we get this required core program completed?

General YATES. The only other thing I can tell you about is that we do plan an enhancement to what we call [deleted]. That's all I know of.

That is included in these enhancements, in this budget.

So, are there numbers that we have not given you to date? No.
 Senator GLENN. Thank you.
 Senator EXON. Thank you.
 Go ahead, General.

SRAM II

[Chart 25 deleted.]

General YATES. Sir, on the SRAM II, chart number 25 is a comparison of the SRAM A and the SRAM II.

The SRAM II is designed to replace the SRAM A. Some of the SRAM As that we will be replacing will be 21 years old by the time they are replaced with the SRAM II.

The SRAM II reaches its IOC in 1993, and we'll have all the SRAM As phased out by 1998.

The shelf life on the SRAM A was 5 years plus. We are recertifying that every 2 years, so we are keeping a close eye on those. It will be 15 years for the SRAM II, and we are buying sufficient missiles to test it over a 25-year period.

Warhead safety has been a growing concern on the SRAM A. The W-89, which is a brand new 1990 technology warhead, is the safest that we have come up with yet.

We have [deleted] SRAM As, and they are declining because we are firing some both for testing and also for this recertification program to make sure the missiles are still okay.

We'll buy 1,633 SRAM IIs to have [deleted]. That keeps this 25-year test plan up and running.

You can see the airplanes that it will be incorporated on.

Today, about 38 percent of the SRAM As that we test fail some avionics or control testing. That is growing.

We figure that by 1993, that will be about half the missiles that we test.

We have an 8-year warranty with the SRAM II, and a .98 reliability.

Senator GLENN. That's .98 what—just on the system, the function within the system itself? It's not .98 on target actions, or anything like that. This is just within the systems?

General YATES. It's system reliability, yes, sir.

[Chart 26 deleted.]

Chart 26 says that beyond all those improvements for warhead safety and inventory, better maintainability, et cetera, that I just talked about, SRAM II is a hard target killer. The main points on this slide are: it is double the reentry speed, it has double the accuracy, and the warhead is larger; it goes from [deleted] up to [deleted].

Senator GLENN. Before we get too far into this chart, back on chart 25, I thought we were going to have the SRAM II on the B-52. It doesn't show up there. You show the B-1 and B-2, and that's it. You're not putting them on the B-52 or the FB-111? I understand about the FB-111, but the B-52 is going to be around a while.

General YATES. That's correct. We do not plan to put it on B-52Hs.

Those B-52s, Senator Glenn, will be in a stand-off role by then. This will go on the penetrating bombers.

Senator GLENN. OK.

General YATES. If you will look, again, at slide 26, you can look at the ranges. This shows you that, relative to a cruise missile, this is a relatively short-range target. But, nevertheless, it keeps the penetrating bomber from having to penetrate target defenses.

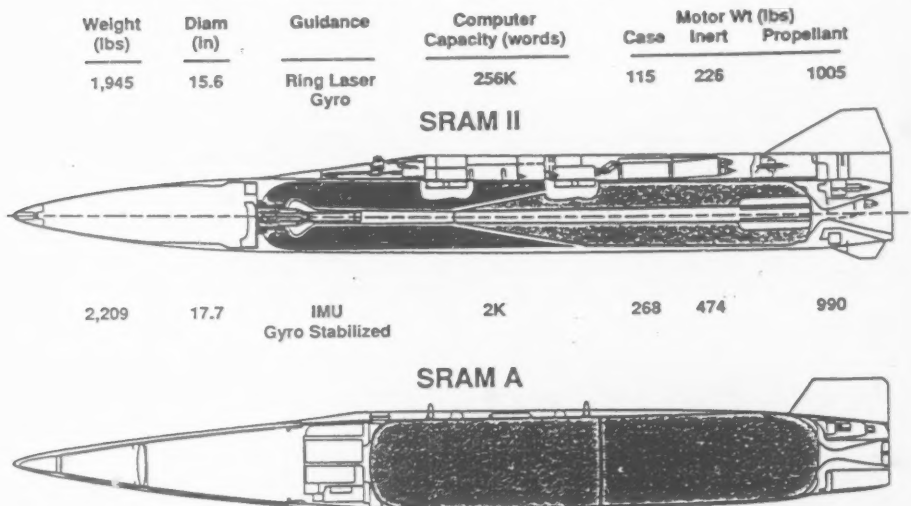
You can look at the range improvements of SRAM II over SRAM A. At a high/high profile, it's about [deleted] and that would be applicable to a B-2 profile. What's very important is to attack targets at the rear. Now, with the SRAM A, they get about a [deleted] mile capability; the SRAM II gets [deleted] miles.

The reason that is important is if you are talking about relocatable targets, with [deleted].

With the new capability, he has about [deleted]. That changes the whole picture.

Chart 27

SRAM II / SRAM A DESIGN COMPARISON



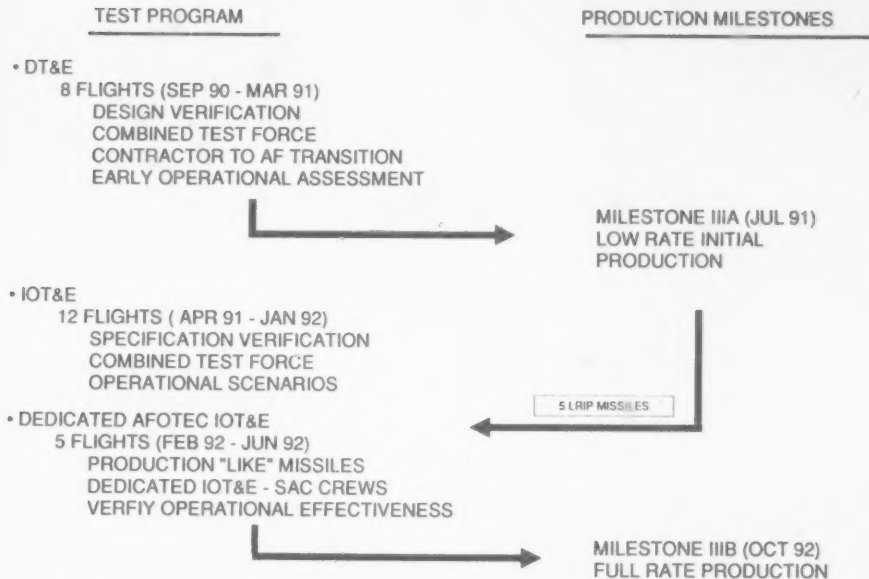
Slide 27 shows you some of the physical changes. We have really gone to school on the SRAM A. We have 17 years of experience. One of the things that you find is that we have a raceway on top of the missile, which contains really the part that we have to maintain. It greatly improves the maintainability.

SRAM II has a VHSIC computer. We are only going to use about 65 percent of the capacity. But that is what gives us the better flight dynamics and the better range we talked about. It will also enable us to communicate with the warhead while it is on the missile, so that we don't have to download the missile and we don't have to take it apart to check the warhead.

Also, the SRAM IIs increased accuracy comes from the ring laser gyro that we have.

Chart 28

SRAM II TEST PROGRAM/MILESTONE APPROVAL



Slide 28 is next. This program does have concurrency in it. But it is an event-driven program, where you have to demonstrate performance prior to going to the next milestone.

If you look at this chart, you can see we have eight DT&E flights between September of 1990 and March of 1991. We have to get those done satisfactorily before we go for the Milestone IIIA decision, the low rate initial production decision, in 1991.

Now, immediately after we do those eight DT&E flights, we're going to start 12 IOT&E flights. But an important part of the IOT&E mission is to take five of those LRIP missiles, production missiles, and put them into the IOT&E program, and we have to have those total 17 IOT&E missiles fired before we go into the full-rate production decision.

Chart 29

SRAM II FYDP FUNDING
FY90/91 AMENDED PRESIDENT'S BUDGET

	FY90	FY91	(TY \$M)		FY94	PROG TOT
			FY92	FY93		
R&D (3600)	217.0	212.8	175.9	13.9	0.0	1069.8
PROCUREMENT (3020)	10.8	83.2	130.0	261.4	285.1	1327.0
TOTAL BUY				1633		
UNIT FLYAWAY COST				\$,722 M		
UNIT TOTAL PROGRAM COST				\$1.47 M		

Would you now go to the last chart, which is chart 29. Those are the resources we are asking for.

1990 is the peak year for R&D funding. The first missile delivery is expected in January of 1990, and the first live launch off a B-1B would be in September of 1990.

1990 is also the first year for procurement funding. There is \$6.4 million for advance procurement of ring laser gyros, avionics chips, rocket propellant chemicals, and actuators. Those are low risk type things, but things which have a long queue.

Then you've got the total buy and the unit cost there.

Sir, I would be happy to answer any questions.

"M" ACCOUNT FUNDING

Senator GLENN [presiding]. General Yates, or either one of you, there is nothing in your presentation about the Air Force's intention to use something called the "M" account funding in order to fix the B-1.

The committee would like to learn about this fund and the rationale for using it on the B-1.

Would you explain that further?

General YATES. Yes, sir, I can.

The "M" account, what happens is once we are appropriated dollars and they are active, during the period of time that they are active—for instance, for procurement funds, Senator, you have 3 years after you appropriate them while those funds are active. For the next 2 years, they go into an expired account.

Now, when they go into an expired account, they lose their program identification. In other words, any B-1 funds we put in an expired account are no longer B-1 funds, like you appropriated them. But they have their year designation. If you appropriated them in fiscal year 1986, they keep that. And they have their procurement account appropriation, like 30/0 aircraft procurement.

After 2 years in that fund, those funds lapse. Then they are put into a merged account, or an "M" account. At that point, they have already lost their program identification earlier. At that point, they lose their year identification. They are no longer fiscal year 1986 funds. But they forever have their congressional appropriation tag, 30/0, that they are available.

This is not, as some people have tried to depict it, some sort of "slush fund." The rules are very specific about what we have to do in order to use those dollars. So, those dollars are set up for us to use, for instance, for over target conditions, which you would not know about in the year that you do the contract; for contingent liabilities, like definitizing change orders.

But in this case, they are also appropriately used for correction of deficiencies.

By the way, over the years, the Comptroller General has issued a series of rulings which govern the way we have to use those funds. So we have to go back. We have to first say that it is a correction of a deficiency of an existing contract. That being the case, those expired funds that we have to use can be applied toward a correction of a deficiency on that contract.

We cannot, for instance, just use it for whatever we wanted to. There has to be a legal ruling that we have a valid correction of deficiency against the contract that we are using.

The first thing you have to do is you have to match it up by year. And if, in fact, you have gone beyond the expired funds, which I have described earlier, and you are into the merged funds, which would be 1986 and earlier at this point, then we'd have to use the merged fund as the only funds that we have available.

So those funds are prescribed in law, and that procedure is as set up by the Comptroller General.

So that is what prescribes the use of it.

Senator GLENN. Do you have a figure for how much is in an "M" account like that? That could be very large amounts of money. Do you have an estimate of how much is in there?

General YATES. As of the end of last year, it was about \$1.7 billion.

Now, again, I want to emphasize that that is not all available to the B-1 program or to any other program. You have to have had a contract and you have to have a legitimate legal call to that contract. And, by the way, once we do that, we have to have the approval of the Secretary of the Air Force. Further, if we are making a call on that contract for more than \$1 million, the rules prescribe that we have to notify the House Appropriations Committee and the other committee chairmen.

Senator GLENN. And the Senate also?

General YATES. Let me check a minute.

No, sir, I misspoke. It's the House Appropriations Committee and the Congressional Budget Office.

Senator GLENN. The Senate doesn't get notified, then, on that. They have to pick it up through CBO, is that correct?

General YATES. Yes, sir. Those are the rules. That is the law.

Senator GLENN. Well, you just notify them, but you don't have to get their approval. So you have, in effect, what is it, \$1.4 billion?

General YATES. It's \$1.7 billion.

Senator GLENN. Yes, \$1.7 billion. Who has to sign off before you can use that?

General YATES. The Secretary of the Air Force.

Senator GLENN. The Secretary of Defense doesn't have to sign off on that at all?

General YATES. No, sir. But it is important to, again, note the limitations.

You have to have had a contract that was existing and effective that year. The work you are doing has to be a legal correction of deficiency against that contract in order to use these dollars.

Senator GLENN. I understand the Air Force has already used \$200 million of the money from the "M" account in connection with the B-1B, and that you ultimately plan to use about \$800 million more from the "M" account to finish the job.

Is that correct?

General YATES. Sir, we have already used \$200 million. Now, \$50 million of that was for the core system that we talked about earlier, and \$150 million of it was for over target for Rockwell. There was an over-target condition on the contract that was on prior year dollars. So we have used about \$200 million.

We believe we will need, out of expired and lapsed funds, about an additional \$744 million.

OVER-TARGET

Senator GLENN. "Over-target" means that we've provided too much money for a Rockwell contract, and you took it off and put it in this account?

General YATES. No, sir.

What it means is this.

Let's say that we know a contract is going to go over target. Let's say it's going to go to ceiling. But it's not going to do that within the 5 years that we have those dollars available to us. In other words, the contractor's going to go over ceiling, but let's just pretend that it's 8 years from now.

We understand it. We're tracking the cost. But there is no way for us to hold on to those dollars for longer than 5 years.

So, after the 5 years, they go into this merged account. By law we have to draw on the merged account to pay that over target.

Senator GLENN. How often do we resort to this method of financing, because this means that what you are saying is we have—and you may not like the term "slush fund," but we have to have a fund of whatever you call it to cover inadequacies of contractor performance or inadequacies of contracting definition to begin with.

General YATES. I wouldn't call them "inadequacies."

Senator GLENN. Well, are they agreeing to something they can't really perform, that they can only perform up to a certain level, and they say we can do more than that then, and we buy it, we take their word for it, and then we wind up having to pay more to get that?

General YATES. Well, you can legitimately say, I guess, if you wanted to take that side of the argument, that any time you go over target, things weren't perfect. You can also say that any time

you are under target that things aren't perfect. But any over-target costs that you don't spend or obligate the dollars within the 5 years, you have to have some legal mechanism to call on the dollars.

The way the Congress set this up, this is a law, this is the way it was set up. It used to function differently. But in about 1971, the Congress wrote a new law on expired dollars and set this fund up, and, in fact, prescribed that you did not have to come back to the Congress to draw on the fund.

Mr. WELCH. Senator Glenn, I believe what would happen is you would be appropriating money twice against the same task.

General YATES. Yes.

Mr. WELCH. Some contracts are set, are budgeted at target. Some, as you know, are budgeted at ceiling, depending upon the risk. The settlement of that is many times out beyond the year limits of the money you appropriate. So it is not a slush fund at all. It is very much a tag account, to not have to go back and reappropriate for tasks that already have an appropriation.

Senator GLENN. Well, I agree. I was just thinking that if we make this the norm in the way of doing business, instead of a rarity, where we have an account, it seems to me it doesn't really hold their feet to the fire as much as we probably should be doing.

Mr. WELCH. I think what is being demonstrated is that there is a very strong general counsel review to make sure of this.

Senator GLENN. It seems like the thing to do would be to come back and ask for more money if we have a problem. Then we would know on a regular basis what the problems are.

Mr. WELCH. If I may respond to that, I don't know that there is a compatibility of time schedules. By the time you come to a point where a contract is settled and they have settled the award fee, we might be 2 years away from being able to fund that award fee.

Senator GLENN. Well, to get us notified and not having to get things second-hand through the House Committee or CBO, is it up to you who you send the report to, or is that prescribed in law?

Mr. WELCH. It's prescribed.

General YATES. It's prescribed in law.

Senator GLENN. How come we got left out on the notification process?

Mr. DEBOBES. I don't know that it is prescribed in law. I don't have any indication of that.

Senator GLENN. Well, they are saying it is prescribed in law. Do you know what law prescribes that? I think we need to alter that law this year.

General YATES. Just a second. Let me try to dig that out.

Senator GLENN. Well, you can give that to us for the record. That is one thing that I would like to see changed, so that I can know what is going on.

That \$1.7 billion, that is just in one appropriation account now, is that right?

[The information follows:]

M ACCOUNT

The law (31 U.S.C. 1551-57) does not call for the notification of Congress for "M" account transactions. However, the chairman and ranking minority members of the

Senate and House Authorization and Appropriation Committees were notified by letter in December of the Air Force intent to use expired accounts, in part, to fund correction of deficiency efforts. The subject was also discussed in various meetings with staff members of these committees.

General YATES. That is in aircraft procurement. Yes, sir.

Senator GLENN. Now, are there more billions in other appropriations accounts that are used the same way?

General YATES. I cannot answer that, sir. I don't know. There is some money in other accounts that is used the same way, but I don't know how much it is.

Mr. WELCH. There is an account tag, but I could not tell you how many dollars are in those accounts at the end of last year.

Senator GLENN. Well, the "M" account, I gather, then, is fairly widely used. What other uses of the "M" account are there besides the ones we have talked about here?

General YATES. Over target conditions and undefinitized change orders.

Senator GLENN. Mr. Welch, what other uses are made of the "M" account that you are aware of?

Mr. WELCH. When you are buying all the necessary items to support something that came on late in the contract, those funds may have expired. It can be anything within the account that has taken so long to complete effectively that the money that was appropriated for it has expired.

PROCUREMENT ACCOUNTS

Senator GLENN. You would have "M" account funds, then, in all sorts of different accounts, I mean, every one of these appropriations accounts would have "M" funds in them.

Is that correct?

Mr. WELCH. The procurement accounts.

Senator GLENN. The procurement accounts.

Mr. WELCH. 30/0; 30/20.

Senator GLENN. For whatever the equipment was, not just the whole aircraft, but for spare parts, the whole works?

Mr. WELCH. Well, spare parts would not be in there, other than the additional spares that go with procurement. The spares would be in the O&M account.

General YATES. Senator Glenn, if I could answer your question and correct something I said a moment ago, the authority is 31 U.S. Code 1552 through 1557. But it is not that which prescribes who gets reported to. The Air Force issues a monthly report on budget execution for each appropriation, and that report is submitted.

Senator GLENN. Well, can you tell us about any other use of "M" account funds for programs other than the B-1 during your term in office, Mr. Welch? Have these been large or small amounts? What other use of "M" accounts have there been?

Mr. WELCH. I would have to get that for the record. If they're below \$100,000, they do not have to come to the Secretary for disbursement. I have not seen in the time I've been there the use of any over \$100,000, other than on this account.

[The information follows:]

M ACCOUNT

Most transactions are for less than \$100,000. However, only those for more than \$100,000 require departmental-level approval. Some of those approved this year include: resolution of utilities dispute taken to the Armed Services Board of Contract Appeals that concerns waste water treatment rates (\$244 thousand); arbitration of a vendor claim involving work schedules on contract for replacement of a base primary electrical system (\$184 thousand); and an engineering change required to correct deficiencies in parts covered by a provisioning contract for engine parts and services (\$270 thousand).

Senator GLENN. Okay. Now on the "M" accounts, is this across the board, all services, all procurement, the works across the board?

Mr. WELCH. Yes.

General YATES. Yes, sir.

Senator GLENN. Mr. Chairman, this "M" account business, I was not aware of this at all. It seems to me that we ought to know something about this. I would think that it would be wise if we asked for the "M" account numbers, what's in "M" accounts now, across the board, for the whole Pentagon. This is something that is not only Air Force, as I understand it.

Is that correct?

Mr. WELCH. Right.

Senator GLENN. It is not only Air Force. It is across the board on all procurement. We may have more billions than we realize in "M" accounts over there.

They may not like the term "slush fund," but let's say "shuffle accounts," on whatever you want to call it. We can use a different term for it.

Mr. WELCH. I think it is an appropriate application of funding to the tasks that they were appropriated for.

Senator GLENN. Well, maybe. But I still have problems that we're this far off that we need \$1 billion here, or \$800 million there, or \$200 million here, that we are not even notified up on this committee, and we are supposed to be on top of all this, protecting taxpayer dollars. I am not sure that that is as tight a contract as you would like, when things come back.

I know that in development of aircraft, you run into problems. Fine. I understand that. But I find it a little difficult to think that we just have a billion here and a billion there, that we can just notify somebody and then use it for other purposes.

Mr. WELCH. But that account is audited from the standpoint of size and other things, and that money could not have accumulated in that account unless it was accumulated in there against a still open purpose.

Then, you know, it is seen every year. The cycle to cause a new appropriation, a new plan, and a new budget submission is the reason I'm told that it was created.

Senator GLENN. Is that so, or is this just anything that just has not been obligated that gets into that account, until it gets used for something else? That's the way it would work, isn't it?

Mr. WELCH. There are two aspects of it. There is an elapsed account, and then there is a surplus account. They are treated differently.

But, again, they cannot come out of that account unless they have been specifically identified in a contract that was specifically appropriated to.

Senator GLENN. This is one that we are going to have to get into in more detail.

Mr. Chairman, just one more question here.

CORRECTION OF A DEFICIENCY AGAINST A CONTRACT

General Yates, I believe you used a term. What precisely is a "correction of a deficiency against a contract?" Is that in an existing contract, a liability, or is it a change that adds to the government's liability?

Mr. WELCH. You see it in all the clauses. Correcting a deficiency is a clause that is usually in there that is a contractor responsibility item, but, in fact, it may have to be run through a sharing formula, as in an incentive contract.

It is generally a correction of a deficiency that ends up being contractor responsibility.

Andy had a question here. Go ahead, Andy, asked your own question.

[Pause.]

Senator EXON [presiding]. I have a question in this regard.

Senator GLENN. Oh, if it is a contractor responsibility, then how do you know how you share it then later on.

Mr. WELCH. Because it flows through the contract. For instance, if it were a fixed price contract, there would be no sharing. But if it incurs contractor costs, it enters into the share ration as any cost would.

General YATES. That's an important point because it has to be the same contract. In other words, that is part of the restriction on this fund. You have to have a legal call against the same contract, which is still open. Then you go and get the money, which the Congress has already appropriated, for accomplishing work on that contract, which then lapsed into the merged account and accumulated, and you withdraw on that pool of money and apply it to that still legal contract. It's not against a new contract. You can't use it against a new contract on new work.

Senator GLENN. Thank you.

Thank you, Mr. Chairman.

Senator EXON. Thank you, Senator Glenn.

Let me see if I can take another stab at straightening this out. I want to ask the following question about the "M" account.

The applicable U.S. Code says, in part, "When the head of an agency decides that part of a withdrawal of obligated balance is required to pay an obligation and make adjustments, that part may be restored to the appropriate account."

Now, let's consider the B-2 program. In each of the past several years, you have over-run the RDT&E balance and have submitted a reprogramming to move B-2 funds from procurement to RDT&E to cover that shortfall.

My question is this. Could you have drawn on the "M" accounts for those funds in the Air Force RDT&E account and make that pay for the B-2 R&D overrun? Could you have done that?

General YATES. No, sir.

Senator EXON. You could not have done that?

General YATES. We could not have done that. The reason is this all starts with the Congress.

So the first call we can make on a merged account is for funds which were appropriated in 1986. So, for any contract that we had ongoing in 1986, that there is spillover work on, we can go to the merged account. So we could not create a new task. For instance, the RDT&E task, which is incrementally funded—and you can look at that as a new task in the B-2—we can't go to the merged account for that.

And we haven't had the 5 years elapse to where the money has migrated into the merged account yet for a task, then that we can go to the merged account and make a call on it.

So it has to be something that Congress appropriated dollars for, that we entered a contract for, in a fiscal year at least 5 years ago. So we can go back to the same contract and say this is a good call against that contract.

Mr. WELCH. Senator Exon, let me give you an example of the same way that it can be done.

You will recall when I talked about the B-2, I said because of a rephrasing of the program as we presented it now, it might roll back into earlier, 1987 and 1988 overhead accounts. We'll not know that for several years. But if that occurred, as an example, in the out-years, we would then look to the merged account for that, and we have provided for those numbers in the look-ahead budget.

So, it has to have a whole loop to the task that we are anticipating.

As General Yates said, you simply cannot have an increased task and go back. I think that was the key point we were trying to make with Senator Glenn, that it is not a slush fund per se, where you have a broad account and then you go back and dip into this.

Senator EXON. Gentlemen, do you see any concern whatsoever, then, with the way that you, in the Air Force, have handled the "M" account?

Are there any improvements that are necessary?

General YATES. Sir, I believe that we have handled the account in accordance with the laws and in accordance with the way that the Comptroller General has established precedent. I don't know myself of anything that we would improve upon.

In fact, there is one comment that I would like to make to you, though, because I know there has been misunderstanding with some of the staff on this. One thing I would like for you to know is that there seems to be some idea that because we went to this "M" account, somehow those dollars were not accounted for under the cost cap of the B-1.

The dollars that we're talking about here—and earlier I asked you to approve an increase from \$20.5 billion to \$20.88 billion—all those dollars that we're talking about are within those cap numbers. So there is no pool.

Senator EXON. So they are within the cap numbers?

General YATES. Yes, sir.

Mr. WELCH. There is no pool of dollars that we have access to that we are not accountable to you for.

Senator EXON. Gentlemen, we appreciate your kind attention and the information that you have given us this morning. It has been very helpful to us.

We probably will be pursuing this "M" account matter to make sure that we fully understand it.

There will be some additional questions for the record, and I would hope that you could give us a very prompt reply to them. We are facing markup here very, very shortly, and I think that you got the impression today from listening to some of us about some of the programs that some of us would like to help you out. We need some additional information to support the B-2, because I suspect this is going to be a difficult issue. We certainly need all of the expertise and information that we can get.

Give us as prompt a reply to our questions as possible.

Thank you.

We are adjourned.

[Questions for the record with answers supplied follow:]

QUESTION SUBMITTED BY SENATOR SAM NUNN

Senator NUNN. Mr. Welch, one question is whether the Nation has any cheaper alternative to the B-2 bomber, once we accept the need for more bombers. Let me ask the following hypothetical question. Suppose we cancel the B-2 and decide to buy 132 more B-1Bs instead. From where we are today, and buying them at a rate not to exceed Secretary Cheney's "three per month" rate for the B-2, can you give us a range of estimates—in then-year dollars—for the cost of 132 more B-1Bs, and compare that to the cost-to-go of the B-2 program, also in then-year dollars. It would be particularly useful if you could provide an unclassified "bottom-line," although I recognize that a detailed enumeration of assumptions may be classified.

[Information was not provided by witness in time for printing.]

QUESTIONS SUBMITTED BY SENATOR J. JAMES EXON

M ACCOUNT

Senator EXON. What is the authority to use M account funds for the correction of a deficiency arising out of a contract?

Mr. WELCH. The process of restoring unobligated amounts from the "merged surplus account" to meet valid obligations of lapsed and expired appropriation accounts is governed by 31 U.S.C. 1551-1557. Determinations regarding whether a contract change is within the scope of the original contract are guided by appropriate provisions of the Federal Acquisition Regulation (FAR), the DOD FAR Supplement, legal principles applicable to scope changes, and the provisions of the DOD Accounting Manual (DOD 7220.9-M).

Senator EXON. Are M account funds used for purposes other than correction of a deficiency arising out of a contract?

Mr. WELCH. Yes, use of expired/lapsed funds includes any legitimate claim against the appropriation.

FUNDING

Senator EXON. What sources of funds, other than the M account, are used to provide funds for correcting deficiencies arising out of a contract?

Mr. WELCH. Corrections that increase the scope of the original contract are funded from funds available at the time the additional requirement is added to the contract. If the correction is within scope, the obligation adjustment would be charged to the appropriation initially charged when the contract was let. This could mean charging an expired account for that appropriation, consisting of unobligated balances, or, if two years have passed since the original appropriation expired, a no-year merged surplus account would be charged. The M account needs to be distinguished from this no-year merged surplus account. The surplus account consists of

unobligated balances, whereas the M account consists of obligated but unexpended balances.

Senator EXON. What is the total amount of M account funds for the Department of the Air Force? Please provide a breakdown of those funds by account or other relevant category.

[Information was not provided by witness in time for printing.]

Senator EXON. How many actions have been taken by the Air Force in each of the last 5 years using M account funds: (a) in amounts of \$100,000 or more; and (b) in amounts of less than \$100,000?

[Information was not provided by witness in time for printing.]

M ACCOUNT

Senator EXON. It is my understanding that once funds are placed in the M account, they are no longer tied to the program for which they were originally appropriated. Thus, is it not possible that funds originally authorized and appropriated by Congress for one program (such as the B-1) could eventually be expended on another program (such as the B-2)?

Mr. WELCH. Yes, it would be possible. But that is true only for obligation adjustments that do not change the scope of the original contract. Also, these within scope changes must be charged only to a surplus account available for the same purpose, e.g., the Aircraft Procurement, Air Force, appropriation. Cost increases due to expansion in scope, e.g., changes in quantity, major configuration changes, etc., are not charged to lapsed accounts.

Senator EXON. DOD accounting manual 7220.9-M provides policies and procedures that governs the use of expired/lapsed M account funds. The Air Force, in compliance with DOD policy, has used monies from the 3010 expired/lapsed M account to fund within scope contract modifications on the B-1 ALQ-161A defensive avionics system "score" program.

What amount of funds have you restored to date from the M account to the B-1 account?

Mr. WELCH. \$274M from the expired/M account has been restored to the B-1 account. \$50M of that amount was for correction of deficiencies on the B-1 ALQ-161A defensive avionics system "core" program and \$224M for other B-1B program contingent liabilities, claims and overtarget.

Senator EXON. What additional amount of funds from the M account do you plan to restore to the B-1 account?

Mr. WELCH. \$757M is the amount of additional expired/M account funds required to complete the B-1 program. \$476M to correct the remaining ALQ-161A deficiencies and \$281M for other B-1B contingent liabilities, claims, and overtarget cost.

Senator EXON. Have you obligated (or do you plan to obligate) for the B-1 any funds from the M account that are derived from funds originally provided by Congress for a system other than the B-1?

Mr. WELCH. Funds merged into the M account lose their fiscal year and program identity. We account for these funds only at the basic symbol level of the lapsing appropriation (i.e., 3010/3600). Amounts available for restoration are limited only by the unobligated fund resources of the account at Air Force level. That is, the Air Force may fund B-1 contract modifications from the 3010/3600 M accounts up to the total amounts available within these accounts. The B-1 program has contributed over \$500M to the expired/lapsed accounts. \$274M has been restored to the B-1 program and the Air Force plans to obligate an additional \$757M from the M account.

Senator EXON. What is the descriptive category of M account funds that are potentially available for use in the B-1 program?

Mr. WELCH. Unobligated balances of the RDT&E, AF, and Aircraft Procurement, AF, appropriations that were withdrawn by the Treasury upon expiration may be restored for valid obligation adjustments. Depending on the fiscal year and appropriation of the original obligation, restoration would be made to one of the expired or merged (no-year) accounts listed below.

Fiscal year 1986/88 Aircraft Procurement, AF; fiscal year 1985/87 Aircraft Procurement, AF; M-Account for Aircraft Procurement, AF; fiscal year 1987/88 RDT&E, AF; fiscal year 1986/87 RDT&E AF; and M-Account for RDT&E, AF.

Senator EXON. What is the present amount of funds in that category.

[Information was not provided by witness in time for printing.]

Senator EXON. How much of those funds have been derived from unexpended B-1 funds?

Mr. WELCH. Over \$500M of B-1 funds have expired/lapsed into the M account. Subsequently, \$274M has been restored to the B-1 program from the M account.

Senator EXON. What notification, if any, is routinely provided to Congress when monies are restored from the M account? What law or regulations govern such notification? In the specific case of the B-1, what congressional notifications were made?

Mr. WELCH. The law (31 U.S.C. 1551-57) does not call for the notification of Congress for these transactions. However, the Chairman and Ranking Minority Members of the Senate and House Authorization and Appropriation Committees were notified by letter in December of the Air Force intent to use expired accounts, in part, to fund B-1 correction of deficiency efforts. The subject has also been discussed in various meetings with staff members of these committees.

Senator EXON. Please briefly describe the criteria utilized and process by which the Air Force decides that: (a) a deficiency has arisen with respect to a contract requiring expenditure of funds; (b) that such funds may be obtained from the M account?

Mr. WELCH. Actions taken regarding a deficiency will depend on the terms of the contract itself and the performance of the contractor in meeting those terms. The contracting officer is primarily responsible for determining whether a correction of a deficiency pursuant to a change clause is within the scope of the contract. In making this determination, the contracting officer is guided by Federal and DOD acquisition and accounting regulations, and legal principles applicable to scope changes. The department general counsel provides guidance and determinations when appropriate. The accounting official would review and validate that the appropriate funding account is chosen. Within scope changes are charged to the appropriation current when the basic contract was awarded. Changes that increase the scope are chargeable to funds current at the time of the amendment increasing the scope. If the upward obligation adjustment exceeds \$100,000, prior approval is required from the Comptroller of the Air Force, as delegated by the Secretary of the Air Force.

RADAR WARNING RECEIVER

Senator EXON. The history of the ALQ-161 defensive avionics system is one of failure to meet specs. The Air Force now proposed to narrow the goals to the so-called "core" configuration, and add a radar warning receiver to cover some of the neglected threats. Would you describe for us why the Air Force is confident that even the "core" configuration can be achieved, and why you are confident about how much it will cost? How much real-world testing of the "core" configuration has been done already?

General YATES. I would think it imprudent to state that achieving the "core" configuration is without risk; however, Eaton/AIL has over the past six months obtained three notable successes that have increased Air Force confidence in meeting core objectives. These are: (1) the company successfully passed its Tail Warning Function (TWF) functional and physical configuration audits and is now installing TWF systems on SAC aircraft; (2) the company has successfully completed lab and flight tests of a new software block which corrects many of the problems in the current version that was tested in the Spring of 1988 and led to the stop work order; and (3) the company just completed a successful preliminary design review (PDR) for the core fixes. We believe Eaton/AIL's delivery of this solid software improvement and description of a sound preliminary design have established a good foundation for achieving the core program.

These successes have been accomplished in a manner which indicates a significant change in Eaton's approach to doing business. Both the audit and the design review were accomplished in an organized, systematic manner. During the design review, the personnel conducting it demonstrated an understanding of system level impacts to proposed changes in design. Answers to questions were provided "bottoms up" rather than "top down." A massive scheduling effort has resulted in a relational schedule data base which permits both visibility and understanding of actual progress against the plan. This scheduling system is being used daily at the working level within Eaton. Both the recent performance demonstrated and the manner in which they were achieved give us some basis for optimism that Eaton may achieve "core" performance at the stated costs.

Our people are closely monitoring Eaton/AIL's budgeted costs and actual costs. To date, we have observed that the company is closely meeting its projections, and we are confident they will not exceed their projected costs of \$725 million.

At this time the core configuration has not been built, therefore it has not been tested. However, before we commit to production, the Air Force will subject this configuration to the most strenuous testing ever attempted with the ALQ-161A. We plan to conduct the following: independent lab testing by Warner-Robins Air Logistics Center; full aircraft/system ground testing in our new anechoic chamber at Edwards AFB; system level threat testing at the Air Force Electronic Warfare Environment Simulator at General Dynamics, Ft. Worth; and complete system level flight testing.

ADVANCED RADAR WARNING RECEIVER

Senator EXON. The recent disputed contract award to Loral Corp for the Advanced Radar Warning Receiver is of interest to this subcommittee, since it is the basis for the radar warning receiver to be added to the B-1B. Would you address the basis for the Air Force's view that the contract should not be re-competed, despite the GAO's determination that the competition was tainted?

Mr. WELCH. On May 12, 1989, the GAO, having concluded on the basis of an FBI affidavit that Loral had improperly obtained source selection sensitive information concerning Litton's radar warning receiver (RWR) system, recommended the Air Force terminate the ARWR contract with Loral. On May 30, 1989, the Air Force formally requested the GAO to reconsider its recommendation. This action was taken on the basis that the GAO did not follow legal precedents which in prior cases held that no remedy is available if no impact on the award decision is shown. The Air Force also cited the GAO's reliance on wiretap information which the Air Force could not use in an adversarial proceeding absent a suppression hearing.

The Air Force believes that terminating the contract before all the facts are available would be premature and could result in additional cost and operational impacts from delays in the receipt of the new system. For instance, if the Air Force concludes that it must ultimately cancel and re-compete the ARWR requirement, it is estimated that the additional RWR costs could range from \$60 million if the recompetition is limited to Loral and Litton, to \$300 million if a full and open competition is conducted, which would include the cost of qualifying new competitor(s) RWR system(s) and costs for installing ALR-69 RWR systems and then retrofitting to a new ARWR. In addition, recompetition would result in a one to four year program slip depending on the acquisition strategy selected.

The Department of Justice is still pursuing its investigation of Loral. The Air Force is working closely with the Department of Justice (DOJ) and has met frequently with DOJ representatives. However, the Air Force is not now in a position to make a final decision on whether to re-compete the ARWR requirement. The Air Force will take appropriate remedial steps when the extent of the alleged improper conduct is determined.

SRAM II

Senator EXON. How much will the SRAM II missile be modified to serve as the Tactical Air-to-Surface, TASM, missile designed for tactical aircraft delivery? Do we change the weight of the missile or its range? Will the TASM require a different nuclear warhead than the SRAM II?

General YATES. We are planning to make minimum modification to the SRAM II missile design in order to make it into the tactical variant, the Short Range Attack Missile—Tactical, SRAM-T. The major engineering change will be to incorporate a tactical nuclear warhead with two yields of 10 kilotons and 100 kilotons. The SRAM II has a strategic warhead with a yield of 200 kilotons. Other modifications that may be required include changes to the missile flight software, control actuators and some additional wiring required to monitor the warhead status and insert operational codes. Most of these changes are required because the SRAM-T will be stored individually in secure vaults and launched from under the fighter's wing, whereas the SRAM II is stored on rotary launchers and launched from the internal bomb bay of the B-1B or B-2. The SRAM II basic weight is approximately 1980 pounds, and although the final SRAM-T warhead has not been selected, we expect the weight to be approximately equal, or even 50 pounds lighter. The SRAM-T has a range requirement of 400 kilometers, which is longer than the SRAM II. By changing the flight software and by lofting the missile from the fighter's wing, the SRAM-T will meet the 400 kilometer range requirement.

B-2 PERFORMANCE GOALS

Senator EXON. Of all of the performance goals established by the Air Force for the B-2, are there any that either will not be met by the B-2 as delivered, or that have been relaxed from the initial specs to make it easier for the as-delivered B-2 to meet the specs?

General YATES. The B-2 is projected to meet all system performance requirements contained in the System Maturity Matrix. Requirements have not been deleted or changed since the completion of the System Maturity Matrix. The System Maturity Matrix has been approved by OSD and provided to Congress.

B-2 PROCUREMENT REDUCTION

Senator EXON. Would you please describe the effects of a major reduction in B-2 procurement funding (on the order of from one-half to zero procurement funds) on the B-2 program. Please indicate as best as you can the impact on the B-2 schedule and cost, the effects at the prime contractor and the major subcontractors, the effects on current contracts and options, and the implications for production restart after a year or reduced or no funding?

General YATES. The Department of Defense plans to purchase 3 aircraft in fiscal year 1990. A major reduction in fiscal year 1990 procurement funding will reduce the number of aircraft that can be purchased and limit availability of advanced procurement funding. The impact to the program would be an increase in total program cost and delayed fielding of the aircraft. RDT&E cost will increase because fixed overhead cost must be allocated over existing contracts. The procurement cost will increase since the delay will require additional overhead for years added to the schedule. Furthermore, a procurement cut in a fiscal year will increase procurement cost in other years because expenditure of funds for a year is spread over six years. Each year added to the program requires an additional \$1 billion for enterprise cost, plus the cost of aircraft procured in the additional year. A cut in procurement will also bring about personnel reductions which will cause schedule delays as new personnel must be trained and adversely impact fixed priced options negotiated with subcontractors.

QUESTIONS SUBMITTED BY SENATOR CARL LEVIN

B-1B ECM

Senator LEVIN. Why did the Air Force accept delivery of these defective systems?

Mr. WELCH. The Air Force accepted these systems because we believed that the capability of the defensive system, however limited, would improve the aircrew's survivability in a high threat environment. In addition, testing results at the time gave us a measure of confidence that later testing proved to be overly optimistic.

Senator LEVIN. By accepting them, didn't the Air Force lose its right to terminate the contract for default and to force Eaton to pay for fixing the flaws?

Mr. WELCH. We have the right to terminate for default. However, the deficiencies in the hardware are not a basis for default under the terms of our contract. We have never forfeited the right to require Eaton/AIL to design and develop the fixes to meet the Air Force specification, which they are required to do under the terms of the contract. By accepting delivery of the hardware we allowed the company to limit its liability for manufacturing the fixes once they were developed and tested. The 1982 production contract has a clause that said Eaton/AIL would share in the cost of manufacturing fixes for deficient hardware up to a cap of \$75.4 million. Beyond that cap the Air Force has to pay for any fixes it requires. This cap was established to limit contractor liability to a known amount because the production and development contracts were signed the same day and the final design was not determined. The Global contract modification restructured the liabilities between Eaton and the government with Eaton assuming full retrofit liability within the incentive price arrangement of the contract. Negotiation with Eaton are going to definitize the Global change order as amended to support the "core" recovery plan.

Senator LEVIN. Was the Air Force under pressure to accept the defective systems so it could meet the deadline of 1987?

Mr. WELCH. I would say it was more of an underestimation of the magnitude of the problem, rather than pressure to meet a deadline.

Senator LEVIN. Will Eaton have to pay for the off-the-shelf receiver? Why not?

Mr. WELCH. Eaton/AIL will not pay for the off-the-shelf receiver. The AF game plan for remedying the ALQ-161 deficiency with Eaton is based upon a prudent risk

program achievable within the technical and management abilities of Eaton Corp. The government would have to terminate Eaton for default on the original program in order for the Air Force to insist upon procurement rights from Eaton.

Senator LEVIN. The off-the-shelf receiver will cost \$489 million—almost half a billion dollars. Why does the taxpayer have to foot the bill?

Mr. WELCH. Although the RWR will fill the situational awareness shortfall of the present ALQ-161 "Core" program, the RWR effort is not associated with the present Eaton contract since the RWR is new procurement requiring new budget authority.

Senator LEVIN. I understand the Air Force is hoping to draft a new agreement by July 31. Will that agreement retain the \$400 million cap for work done on the ECM? Will it require all the work in the CORE program to be done within the \$400 million cap?

Mr. WELCH. There is no \$400 million cap provision in our contracts with Eaton/AIL for work done on the B-1B ECM.

Senator LEVIN. Eaton has apparently estimated that the repairs the United States wants them to perform on the ECM system, called the CORE program, will cost \$725 million. Does that mean the United States will pay the first \$400 million and Eaton will pay the rest?

Mr. WELCH. Eaton/AIL will share the cost up to \$75.4 million, and provide a minimum of \$28.5 million of free work in consideration for poor performance.

[Whereupon, at 12:13 p.m., the subcommittee adjourned, to reconvene upon the call of the Chair.]



DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEARS 1990 AND 1991

WEDNESDAY, JUNE 14, 1989

U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC FORCES
AND NUCLEAR DETERRENCE,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

NATO NUCLEAR DETERRENCE

The subcommittee met in executive session at 9:36 a.m. in room SR-222, Russell Senate Office Building, Senator J. James Exon (chairman of the subcommittee) presiding.

Committee members present: Senators Exon, Nunn, Thurmond, Cohen, Wilson, Wallop, and Gorton.

Committee staff member present: Lucia M. Chavez, security control officer.

Professional staff members present: Robert G. Bell and Sherri W. Goodman.

Minority staff members present: Brian D. Dailey and George W. Lauffer, professional staff members.

Committee members' assistants present: Jeffrey B. Subko, assistant to Senator Exon; Kenneth N. Luongo, assistant to Senator Levin; Donald A. Mitchell, assistant to Senator Glenn; Leon S. Fuerth, assistant to Senator Gore; Terrence M. Lynch, assistant to Senator Shelby; James M. Bodner, assistant to Senator Cohen; Dudley L. Carlson, assistant to Senator Wilson; Jack D. Crouch II, assistant to Senator Wallop; Robert M. Soofer, assistant to Senator Gorton; and Eric H. Thoemmes, assistant to Senator Coats.

OPENING STATEMENT OF SENATOR J. JAMES EXON, CHAIRMAN

Senator EXON. The subcommittee will please come to order.

For the information of all, we have two panels today. The first panel will meet in closed session; and when we finish the testimony from the first panel, we will have questions and then we will go open for the second panel.

The subcommittee meets this morning to receive testimony on the NATO nuclear deterrence in review of S. 1085, the DOD authorization bill for fiscal years 1990-1991. As stated earlier, we will begin the hearing in closed session, and we will move into open session when we finish this panel and go to the next one.

The first panel will address the budget request for fiscal year 1990 for tactical and theater nuclear systems. The witnesses on this panel are:

Robert G. Joseph, Deputy Assistant Secretary of Defense for Nuclear Forces and Arms Control Policy; Gen. E.S. Leland, Jr., Chief of Staff, U.S. European Command; and Brig. Gen. William S. Chen, Assistant Deputy for Systems Management to the Assistant Secretary of the Army for Research, Development, Acquisition.

I propose that we proceed with Secretary Joseph's review of the highlights of the administration request for these systems and then hear from General Leland on his perspective of the military requirements for these weapons, followed by General Chen with a brief report on the status of the planning for the Follow-On To Lance System. We will remain in closed session while we question the witnesses on these matters.

We will then hear from the second panel, Ambassador Paul H. Nitze and Dr. William Van Cleave.

Senator Thurmond, my friend and colleague, do you have any opening remarks?

Senator THURMOND. Yes, Mr. Chairman, I do, I think it would be more appropriate to use them for the second panel.

Senator EXON. I appreciate that. And with that, Secretary Joseph, we welcome you and thank you and your colleagues for being here today on a very important matter to our subcommittee. Please proceed.

STATEMENT OF ROBERT G. JOSEPH, ASSISTANT SECRETARY OF DEFENSE FOR INTERNATIONAL SECURITY POLICY (ACTING)

Mr. JOSEPH. Thank you, Senator. We are pleased to be here today to address why nuclear forces in Europe, especially short-range nuclear forces or SNF, will continue to play an essential role in Alliance strategy.

Today I will address the rationale behind our ongoing modernization programs, and I will also look at the issue of SNF arms control in the context of next steps in light of the recent NATO Summit. In that connection, I will discuss our position on SNF negotiations and the problems associated with SNF arms control if and when the United States does enter such negotiations with the Soviet Union.

I have a relatively lengthy prepared classified statement, which I propose be submitted for the record.

Senator EXON. Without objection, it will be accepted as part of the record. We would appreciate it if you could summarize.

Mr. JOSEPH. Sir, I also have an unclassified statement which I would like, if you agree, to place into the record for the open session.

Senator EXON. Without objection, that is so ordered and it will be placed in the record as part of the open testimony.

Mr. JOSEPH. Thank you, Senator.

Let me begin with the role of theater nuclear forces in Alliance strategy. The requirement for theater nuclear forces in Europe, including short-range nuclear missiles and artillery, has long been

recognized as critical for sustaining NATO's agreed strategy of flexible response and forward defense.

This requirement does not primarily derive from the existence of Warsaw Pact nuclear forces. Rather, NATO's nuclear requirements are based on the overall threat represented by the Warsaw Pact and our assessment of what is required to maintain deterrence in light of that threat. It is the massive conventional force imbalance that favors the Pact which figures prominently in our calculations with regard to the number of theater nuclear forces that we need. Nevertheless, while a reduction in the threat or a correction in the current NATO-Pact imbalances would reduce the requirement for nuclear forces in Europe, it would not eliminate the enduring role of theater nuclear weapons in our strategy.

I know that I need not go into great detail today about NATO's 1983 Montebello Decision and the subsequent recommendations provided by SACEUR in his 1985 Nuclear Weapons Requirements Study (NWRS-85). Assistant Secretary Lehman provided the Senate Armed Service Committee with a comprehensive review of the status of the Montebello programs last spring.

I think that I need only recall here that the Alliance envisioned, and SACEUR specified, a number of modernization requirements for NATO's nuclear forces. These included a system to replace the obsolescing Lance missile, a stand-off air-to-surface missile to enhance the survivability of our dual-capable aircraft, and modern nuclear artillery rounds to replace the current aging rounds on a less than one-for-one basis.

In work that began in 1987 just prior to the signing of the INF Treaty, NATO's Nuclear Planning Group (NPG) examined how the Alliance's post-INF forces should be structured. Among its recommendations, the Nuclear Planning Group, in April 1988, reaffirmed the need for a Lance follow-on, for a tactical air-to-surface missile, or TASM, and for modern artillery rounds, [deleted].

NPG Ministers also stressed the importance of [deleted].

In October of last year, the Nuclear Planning Group [deleted].

In January of this year, SACEUR presented to the Alliance the results of his 1988 Nuclear Weapons Requirements Study (NWRS-88). NWRS-88 confirmed the previous findings on the need for continued modernization and especially the development of a tactical air-to-surface missile and a Follow-On To Lance for introduction in the mid-1990's.

SACEUR's study assessed [deleted].

Let me just review the rationale of what we need to modernize our forces. I believe that the Montebello Decision and the more recent work by the NPG and NATO military authorities provide a clear road map for ensuring the continued credibility of NATO's deterrent strategy with a minimum number of nuclear weapons required for deterrence.

While we have agreed that specific deployment decisions from our allies are not required at this time, and that a decision on the Follow-On To Lance deployment is not required until 1992, the requirements for a Follow-On To Lance, a tactical air-to-surface missile, and modern artillery rounds, remain valid today.

Some have argued that we should attempt to extend the life of the current Lance missile to avoid the political disadvantages of de-

playing a new missile. The key point that I believe should be made in this context—and it is one that is often overlooked—is that Lance does not meet NATO requirements.

Consistent with the conclusions of the High-Level Group's paper on the role of short-range nuclear forces, [deleted]. The limited range of the current Lance and the limited number of launchers from which the current Lance missile can be fired, significantly degrade the system's survivability.

Having already extended the service life of Lance previously, the Lance, which I think we must remember is based on 1960's technology, is now rapidly approaching obsolescence. A second service life extension program would prolong this condition and would undermine NATO deterrence by increasing dependence on NATO's dual-capable aircraft. Because these aircraft are deployed at a relatively few number of bases in Europe, they are vulnerable to preemptive Warsaw Pact strikes. Moreover, greater reliance on dual-capable aircraft for nuclear delivery would mean that fewer aircraft would be available for conventional operations, with perhaps the consequence that the nuclear threshold would be reduced.

Prolonging Lance's life would also force us to retain a force structure that could otherwise be used for conventional missions. The Follow-On To Lance will utilize the Multiple Launch Rocket System, the MLRS launcher, and its associated force structure. Retaining the current Lance would foreclose the option of using the manpower that is dedicated to the nuclear-only Lance to create four additional dual capable MLRS battalions.

To get an idea of the artillery firepower, conventional firepower that would be lost under these circumstances, I think we need to consider that one salvo of 12 9-inch rockets from one MLRS launcher has the equivalent firepower of 88 155-millimeter howitzers.

In addition, the capability of these four battalions to deliver conventionally armed ATACM's on deep targets would be lost.

By contrast, [deleted] Follow-On To Lance missile—and I might add that this is fully compliant with the spirit and letter of the INF Treaty—will offer very important advantages. Increased range will, of course, enhance deep target coverage, including important fixed and mobile targets.

Moreover, the Follow-On To Lance will permit increased use of NATO's dual capable aircraft for even deeper targets and conventional roles. It will provide for enhanced system survivability by permitting greater setback and will provide greater operational flexibility, such as support to adjacent corps.

That the Follow-On To Lance will use the MLRS launcher ensures opportunities for widespread basing, which demonstrates alliance solidarity and underlines the collective contribution and commitment of the members of the Alliance to our common security objectives.

Similarly, a tactical air-to-surface missile [deleted] for NATO's dual-capable aircraft is essential. The role of dual-capable aircraft in providing deterrence will naturally increase with the elimination of INF missiles.

A TASM, or tactical air-to-surface missile, which could be widely deployed on NATO aircraft, such as the F-111, the F-15E, the F-16, and the Tornado, will counter improvements in Warsaw Pact

air defenses and will improve our capability to hold at risk heavily defended targets, especially those deep in Warsaw Pact territory, including inside the Soviet Union.

With regard to artillery, a fully effective force requires the continued replacement of NATO's older, 8-inch nuclear artillery rounds, as well as the 155-millimeter rounds, with rounds that have increased range and that incorporate the most modern safety and security features.

The combination of age, complex assembly procedures, inadequate yield, and very short range of current artillery systems significantly limit their utility. [Deleted] a modernized nuclear artillery force will continue to make an important contribution to deterrence, both by holding at risk Pact leading echelons and as a visible demonstration of Alliance cohesion.

Now, if I can, I will just take a few moments and look at next steps with regard to modernization and arms control. In the weeks preceding the NATO summit, the Soviet Union intensified its campaign to split the Alliance on both modernization and SNF arms control issues. NATO, however, stood firm and endorsed a comprehensive concept of arms control that once again reaffirms the indispensable role of nuclear weapons in NATO's strategy and the Alliance's commitment to keep its nuclear forces up to date as necessary.

NATO leaders in the comprehensive concept agreed that land; sea; and air-launched systems in Europe are all necessary components of NATO's deterrent posture. In this connection, the Alliance again reiterated its support for U.S. research and development programs designed to fulfill the requirements stemming from Montebello. We agreed that specific decisions on deployment of Follow-On To Lance need not be taken until 1992.

But we reaffirmed the importance of keeping our nuclear forces up to date where necessary. NATO leaders also reaffirmed that the Alliance's top priority in the context of arms control remains the elimination of Warsaw Pact-NATO conventional force imbalances, which represent the most critical threat to Europe's security.

Recognizing that preponderant Pact conventional forces are a major reason why NATO deploys short-range nuclear forces, we agreed that SNF negotiations to achieve a partial reduction in the number of U.S. and Soviet land-based SNF missile forces made sense only in the context of the implementation of a CFE agreement which provided for the elimination of force imbalances in Europe.

In accepting the principle of SNF negotiations, the Alliance expressly ruled out a "third zero" and agreed that negotiated reductions would not be undertaken until the results of a CFE agreement had been fully implemented. The agreements reached at the Summit provide, in my view, a sound basis for the maintenance of military strength and political solidarity essential for the security of the Alliance.

Even with regard to SNF negotiations, which many believed would precipitate a failed Summit, the Alliance has achieved an extraordinary consensus on the proper role and place of arms control in Alliance strategy.

As we look past the CFE negotiations toward the possibility of SNF negotiations, we must recognize that there are challenges and problems that we will face. The first, of course, is that we differ significantly with the Soviet Union on what the objectives of those negotiations should be.

Whereas we have expressly ruled out the "third zero" because of the dangers it represents in terms of the denuclearization of Europe, the Soviets have made clear that their ultimate objective in any SNF negotiation would be to achieve the next step toward the elimination of nuclear forces in Europe.

Second, of course, are the verification problems that exist, which are inherent with any attempt to monitor small mobile missiles.

Third, we have the concern with regard to potential political dynamics which could argue for moving toward a "third zero" in the negotiations.

Let me close by emphasizing again the degree to which NATO governments are in agreement on the absolute need for effective and up to date nuclear forces to support our agreed strategy of flexible response. The Soviet Union can be expected, of course, to continue its efforts to split the Alliance, as it attempted to do before the Summit, and maintaining unanimity among 16 sovereign nations within NATO is never easy.

But I am confident that the Alliance, as it did during the early eighties in the face of Soviet efforts to divide the Alliance on a question of INF deployments, will muster the same courage that it did at that time and will take whatever steps are necessary to maintain its legitimate defense and deterrent requirements.

Thank you.

[The prepared statement of Mr. Joseph follows:]

PREPARED STATEMENT OF ROBERT G. JOSEPH, ASSISTANT SECRETARY OF DEFENSE FOR
INTERNATIONAL SECURITY POLICY (ACTING)

INTRODUCTION

I am pleased to appear before the Armed Services Committee in my capacity as Acting Assistant Secretary of Defense for International Security Policy. I would like to address today why nuclear forces in Europe, especially short-range nuclear forces (SNF)—ground-based missiles and artillery with ranges less than 500 kms—will continue to play an essential role in Alliance strategy. As you know, Alliance leaders at last month's Summit meeting reaffirmed the need for such nuclear forces "as far as can be foreseen." The essential contribution that NATO's theater nuclear forces (TNF) make to deterrence clearly underscores the fundamental importance of modernizing our nuclear forces in Europe. On this basis, I would like to discuss our ongoing modernization programs and the specific advantages of deploying these systems. Finally, I would like to outline our next step, in light of the recent Summit. In that connection, I would like to explain fully our position on SNF negotiations and the dangers the United States will face as we enter such negotiations with the Soviet Union.

ROLE OF TNF IN ALLIANCE STRATEGY

The requirement for theater nuclear weapons in Europe—including SNF missiles and artillery—has long been recognized as critical for sustaining NATO's agreed strategy of flexible response and forward defense. Indeed, Defense Ministers reaffirmed at the April Nuclear Planning Group (NPG) meeting NATO's determination to ensure that we possess diversified, survivable and operationally flexible nuclear forces across the entire spectrum of ranges, which must be kept up-to-date where necessary. Unfortunately, this constancy of view is often obscured by daily headlines that focus on healthy differences among Allies on how best to implement our agreed strategy.

It is important to recall that NATO's requirement for nuclear forces does not primarily derive from the existence of Warsaw Pact nuclear weapons. Rather, NATO stockpile requirements are based on the overall Warsaw Pact threat and our assessment of what is required to maintain deterrence. It is the massive conventional force imbalances favoring the Pact which figure prominently in our calculations. Nevertheless, while a reduction in the threat or rectification of the current imbalances that exist between NATO and the Warsaw Pact would reduce requirements for nuclear forces in Europe, it would not eliminate the enduring role of nuclear weapons in our strategy.

NATO's theater nuclear forces contribute to deterrence of conventional attack by complicating Warsaw Pact planning and by confronting the Pact with the prospect of escalation on NATO's terms. In doing so, they contribute to Pact uncertainties about how, when and where NATO would respond to attack. In addition, these forces—SNF in particular—reduce Pact confidence in its ability to mass its numerically superior conventional forces to break through NATO's forward defenses or to maintain the momentum of a breakthrough. NATO's nuclear forces also, of course, deter the enemy's use of nuclear weapons by providing a capability to respond in kind. Should deterrence fail, these weapons would play an essential role in convincing the Warsaw Pact to cease aggression and withdraw from NATO territory and to restore deterrence. In order to deny the enemy any confidence that it can achieve its objective in any kind of attack without paying an unacceptable toll, NATO's nuclear forces must offer a broad range of options to strike targets from the immediate battlefield to deep into enemy territory, including the Soviet Union.

It is on this basis that NATO NPG Ministers agreed at Montebello, Canada in 1983 to reduce the nuclear stockpile in Europe by 1400—following a similar, unilateral reduction of 1000 weapons announced in 1979—while at the same time agreeing that NATO must act to ensure that the remaining warheads and their delivery systems were responsive, survivable, and effective. At the time, NPG Ministers requested the Supreme Allied Commander, Europe (SACEUR) to develop recommendations on how to implement the Montebello Decision.

I know I need not go into great detail about the recommendations provided by SACEUR in his 1985 Nuclear Weapons Requirement Study (NWRS-85), as this is quite familiar ground for the committee. Assistant Secretary Lehman provided the SASC an excellent review of the status of Montebello programs last Spring, which I commend to you. We need only recall here that SACEUR specified—and let me emphasize that this was in 1985—a number of modernization requirements for NATO's nuclear forces, including a system to replace the rapidly obsolescing Lance missile, a standoff air-to-surface missile to enhance the survivability of dual-capable aircraft, and modern nuclear artillery rounds to replace the current, obsolescent rounds on a less than one-for-one basis.

In work begun in 1987, just prior to the signing of the INF Treaty, the NPG examined how NATO's post-INF forces should be structured. Among other recommendations, the NPG in April 1988 reaffirmed the need for a Follow-On to Lance (FOTL), a tactical air-to-surface missile (TASM) and modern artillery-fired atomic projectiles (AFAPs) [deleted]. Ministers also stressed the importance of [deleted].

In order to establish further the NATO consensus for proceeding with the modernization of NATO's nuclear forces in the wake of the INF Treaty, the NPG asked the High Level Group to examine the role of SNF in NATO's deterrent strategy. At their October 1988 meeting in The Netherlands, NPG Ministers [deleted].

In January 1989, SACEUR presented to the Alliance the results of his 1988 Nuclear Weapons Requirement Study (NWRS-88) that confirmed the NPG's previous findings on the need for continued modernization, especially the development of a TASM and FOTL for introduction in the mid 1990s. SACEUR determined that given the current and projected shortcomings in NATO's nuclear posture, deployment of these systems is needed to provide for the assurance levels which underpin deterrence. NWRS-88 assesses that deployment of modernized systems, and the associated restructuring of NATO's SNF to shift the emphasis to longer-ranges, would permit the Alliance to reduce its total nuclear stockpile [deleted]. Finally, NWRS-88 indicates that reductions in the conventional threat, while not removing the need for survivable and operationally flexible SNF, would open the possibility of further reductions in NATO nuclear stockpile.

WHY WE NEED TO MODERNIZE

For the foreseeable future, our strategy of deterrence will continue to require both conventional and nuclear weapons. The Montebello Decision and the more recent work by the NPG and NATO Military Authorities, especially SACEUR's

NWRS-88, have provided a clear road map for ensuring the continued credibility of NATO's deterrent strategy, with a minimum number of nuclear weapons. While we have agreed that specific decisions from our Allies are not required now, and that a decision on FOTL deployment is not required until 1992, the requirements for a FOTL, TASM and modern AFAPs remain valid today, and NATO nations have consistently and publicly—as recently as last month at the NATO Summit—expressed their continued support for U.S. efforts to meet these requirements.

FOTL AND TASM

At the forefront of the debate over SNF modernization has been the long-identified requirement for a FOTL. Some have argued that we should attempt to extend the life of Lance in order to avoid the political disadvantages of deploying a new missile.

The key point that should be made—but is nearly always overlooked—is that Lance does not meet NATO requirements. Consistent with the conclusions of the HLG's paper on the role of SNF, SACEUR has established a requirement for an SSM of longer range [deleted]. The limited range of the Lance, its complex loading procedures and the limited number of launchers from which the missile can be fired, all degrade significantly the system's survivability. Having already had its service life extended once, the Lance—based on 1960s technology—is now rapidly approaching obsolescence. A second service life extension program, or SLEP, would prolong this condition, undermining NATO deterrence by increasing dependence on dual-capable aircraft. Because DCA are deployed at relatively few bases in Europe, they are vulnerable to preemptive strikes by the Warsaw Pact. Moreover, greater reliance on DCA for nuclear delivery would mean that fewer would be available for conventional operations.

Prolonging Lance's life would also force us to retain force structure that could otherwise be used for other purposes. The FOTL will utilize the Multiple-Launch Rocket System (MLRS) launcher and associated force structure. Retaining Lance would foreclose the option of using the manpower dedicated to the nuclear-only Lance to create four additional dual-capable MLRS battalions. To get an idea of the artillery firepower that would be lost, consider that one salvo of 12 8-inch rockets from one MLRS launcher has the equivalent firepower of 88 155-mm howitzers. In addition, the capability of these four battalions to deliver conventionally-armed ATACMs on deep targets would be lost.

By contrast, a [deleted] FOTL—which is fully compliant with the INF Treaty—will offer important advantages. Increased range will, of course, enhance deep target coverage, including important fixed and mobile targets. Moreover, the FOTL will permit increased use of NATO DCA for even deeper targets and conventional roles. It will provide for enhanced system survivability by permitting greater set-back and would provide greater operational flexibility, such as support to adjacent corps. That the FOTL will use the MLRS launcher ensures opportunities for widespread basing, which demonstrates Alliance solidarity and underlines the collective contribution and commitment of its members to Alliance security objectives.

Similarly, a tactical air-to-surface missile [deleted] for NATO's dual-capable aircraft is essential. The role of dual-capable aircraft in providing deterrence and coupling the defense of Europe to strategic forces of the United States will naturally increase with the elimination of INF missiles. A TASM, widely deployed on NATO DCA—such as the F-111, F-15E, F-16 and Tornado aircraft—will counter improvements in Warsaw Pact air defenses and improve our capability to hold at risk heavily defended targets, especially those deep in Warsaw Pact territory. The extension of effective DCA range, enhanced aircraft survivability and increased penetrativity associated with deployment of TASM will measurably enhance NATO's deterrent posture.

In order to allow for timely and appropriate allied decisions on deployment of modernized systems, the United States in mid-1988 initiated development programs for the FOTL and TASM. Both the TASM and FOTL programs are expected to meet SACEUR's requirement for [deleted] initial operating capability and the range requirements set forth in NWRS-88 [deleted]. Late last year, the United States selected the M270 launcher for the Multiple-Launch Rocket System (MLRS) for the FOTL, and we are currently investigating candidates for the FOTL missile, with an aim toward missile selection by mid-1990. Additionally, the United States selected in November 1988 a modified version of the short-range attack missile (SRAM) II to meet the TASM requirement; studies addressing TASM design and integration are now underway.

Until now, funding for those two key programs has been at a low level. Only FOTL required limited funding last year; we asked for \$15 million and received \$7.5 million. Full funding for FOTL and TASM in fiscal year 1990 and fiscal year 1991, while not large, is essential in order to be able to meet their required deployment date [deleted].

AFAPS

A fully effective SNF force also requires the continuing replacement of NATO's older 155-mm and 8-inch nuclear artillery rounds with rounds that have increased range and incorporate modern safety and security features. The combination of age, complex assembly procedures, inadequate yields and very short range of current artillery systems limit their utility. [Deleted] a modernized nuclear artillery force will continue to make an important contribution to deterrence, both by holding at risk Pact leading echelons and as a visible demonstration of Allied cohesion.

Our ability to support SACEUR's requirement for modern AFAPs is, however, jeopardized by the congressional limitation on the production of modernized artillery rounds—8-inch and 155mm—to 925. We completed production of [deleted] 8-inch rounds in 1986, and are currently in the final stages of research and development for the new 155mm round. While we are currently limited to production of [deleted] 155mm rounds by the congressional cap, we will need to lift this restriction to meet our worldwide requirements for modernized artillery and retire all of the existing obsolescent rounds. Even with the significant reductions in our nuclear [deleted] stockpile envisioned [deleted], we will still require more than 925 rounds.

NEXT STEPS

In the weeks preceding the NATO Summit of Heads of State and Government, the Soviet Union intensified its campaign to split the Alliance on modernization and arms control issues. NATO, however, stood firm, and endorsed a comprehensive concept of arms control and disarmament that once again reaffirmed the indispensable role of nuclear weapons in NATO strategy and the Alliance's commitment to keep its nuclear forces up-to-date as necessary. NATO leaders agreed that land-, sea-, and air-launched systems in Europe are all necessary components of NATO's deterrent posture. In this connection, the Alliance again reiterated its support for U.S. research and development programs designed to fulfill the requirements stemming from Montebello. We agreed, as we had at the April NPG meeting, that specific decisions on deployment of FOTL need not be taken until 1992.

The Alliance also recognized the extremely limited scope of the Soviet Union's announced plan to remove from Eastern Europe 500 nuclear weapons, especially when compared to the huge number of nuclear weapons that would remain. Moreover, the Soviet plan pales in comparison to the 2400 nuclear weapons which NATO has unilaterally withdrawn from Europe since 1979—five times the number announced by the Soviets. In view of the Warsaw Pact's massive superiority in SNF forces—the result of an aggressive, decade long modernization program—the Alliance called upon the Soviet Union to reduce unilaterally its short range missile systems.

Finally, the Alliance also addressed its arms control priorities. In keeping with arms control objectives agreed to at Reykjavik in 1987, NATO leaders reaffirmed that the Alliance's top priority in Europe remains the elimination of Warsaw Pact-NATO conventional force imbalances, which represent the most critical threat to Europe's security. Recognizing that preponderant Pact conventional forces are a major reason why NATO deploys short-range nuclear forces, we agreed that SNF negotiations to achieve a partial reduction in the number of U.S. and Soviet land-based nuclear missile forces to equal and verifiable levels below the present NATO level made sense only once implementation of an accord eliminating conventional force imbalances in Europe was underway. In accepting the principle of SNF negotiations, the Alliance ruled out a "third zero" and agreed that negotiated reductions would not be carried out until the results of the CFE negotiations had been implemented. Thus, the current work at hand remains the talks on Conventional Forces in Europe (CFE) that are taking place in Vienna.

The agreements reached at the Summit provide a sound basis for the maintenance of military strength and political solidarity essential for the security of the Alliance. Even with regard to SNF negotiations, which many thought would precipitate a "failed" Summit, the Alliance has achieved an extraordinary consensus on the proper role and place of arms control in our security policy.

As we look past the CFE negotiations and toward the possibility of U.S.-Soviet negotiations on SNF, we must recall such negotiations are not without inherent dangers.

Negotiations—be they over wages, tariffs or armament—are most successful when all parties to the negotiation have a shared set of goals. Unfortunately, this is not the case with NATO and the Soviet Union on the subject of SNF missiles. The Soviets have one ultimate goal in mind—the denuclearization of Europe. Given the role nuclear weapons play in sustaining NATO's strategy of flexible response, we must avoid a denuclearization of Europe which would undercut the credibility of deterrence and would leave NATO vulnerable (even in the face of significant cuts in the Pact's conventional forces). This will not be easy, because for a host of political and technical reasons, proposals for a "third zero" will be attractive to many. The Alliance will need to stand strong and together so that negotiations undertaken to enhance our security will lead to the opposite result.

Moreover, the difficulties inherent in effectively verifying limits on SNF are particularly daunting. The systems are small, highly mobile and have both nuclear and non-nuclear missions. Trying to solve the verification challenge created by dual-capable systems by capturing all SNF launchers would place unacceptable constraints on our conventional capabilities; endowing our SNF systems with "externally observable differences" would decrease system survivability and do nothing to resolve our verification concerns with Soviet SNF systems. And we would still be faced with the problem of verifying limits on SNF missiles, which can be easily reloaded onto SNF launchers. We will certainly need to consider the verification lessons of CFE before considering how we can effectively verify systems where there can be far less margin for error.

Finally, there is the danger that, now that we have agreed in principle to SNF negotiations under certain circumstances, it will be politically difficult for the Alliance to take the modernization steps necessary to ensure that continued credibility of our deterrent posture. I am certain that the Warsaw Pact will not face the same political constraints as the West and that their modernization programs will continue. The Alliance must remember—as should Congress as it considers the fiscal year 1990 defense budget—that not modernizing will have the same effect as accepting a triple zero outcome.

Let me close by emphasizing again the degree to which NATO governments are in agreement on the absolute need for effective and up-to-date nuclear forces to support our agreed strategy of flexible response. The Soviet Union can be expected, of course, to continue in its efforts to split the Alliance, as it baldly attempted to do before the Summit. Maintaining unity among 16 sovereign nations is never easy. But I am confident that the Alliance, as it did during the early 1980s in the face of Soviet attempts to divide the Alliance on INF deployments, will muster the same kind of courage and will necessary to maintain its freedom.

Senator EXON. Thank you, Mr. Secretary.

We will proceed with the next witness and hold our questions until the panel has finished their presentations.

General Leland.

STATEMENT OF LT. GEN. E.S. LELAND, JR., U.S. ARMY, CHIEF OF STAFF, U.S. EUROPEAN COMMAND

General LELAND. Sir, I am Lt. Gen. Ed Leland, the Chief of Staff of the European Command.

I agree with Mr. Joseph's excellent statement and therefore do not propose to readdress the same points.

I have submitted for the record a written statement and I propose to just briefly summarize.

Senator EXON. Without objection, your full written statement will be accepted for the record. We appreciate your summarizing your statement.

General LELAND. Sir, I will tell you a little bit of my background so you will understand the perspective I bring to the subject. I am obviously an Army officer. My branch is armor. I commanded a brigade and a company in the United States and a battalion and an armored division in Europe.

I am currently General Galvin's Chief of Staff at Headquarters European Command. I have been in Europe for 3 years on this assignment and in this particular position for 1 year.

Hence, what you will get from me is a conventional force commander's perspective on theater nuclear forces shaped by the view of our joint headquarters.

Senator THURMOND. The machines are not on. We can hardly hear you. Would you speak up.

Senator EXON. Speak up a little bit, General. Those microphones are not turned on right now, they are there just for effect.

[Laughter.]

General LELAND. Sir, it is obvious that Europe, and the security of Europe, is important to the United States due to shared values, economics, and proximity to the Soviet Union.

Our mission is to deter war and then, if that fails, to defend. Our strategy is flexible response and forward defense. There are three elements of that strategy in terms of capability: conventional, theater nuclear, and strategic nuclear.

It has been our strategy for over 20 years and it has worked very well. There are many alternatives, but we do not know of one that contains less risk than the one we have now. We believe our current posture vis-a-vis the Soviet Union is in part the result of the success of that strategy.

In order for nuclear deterrence to work, we have got to be credible, and if we are going to be credible, we must have a theater nuclear capability across the spectrum of ranges and yields. From a military commander's perspective, we require a variety of choices. We need to be able to tailor the type weapons and warhead to the targets we want to engage at the various ranges.

They also have to be survivable. If the systems we have can be easily destroyed, then the temptation of a preemptive strike is obvious.

We need an obvious U.S. commitment to the theater strategy represented by a continuum of U.S. capability that goes from the artillery, which is very close to the front, back through the theater to the strategic systems.

It is also important that the nuclear aspects of the strategy be seen as an Alliance commitment. The weapons stationed on the territory of our allies, and the Allied capability to deliver these weapons, are very important.

What we are after is uncertainty. We want the Soviets to believe, and our assessment is they currently do believe, we will use those weapons. If they think that they are at risk. And we want them to believe they are at risk no matter what military option they might choose.

In order to be credible, we also have to modernize. We have to modernize because our theater nuclear systems are very old. The artillery ammunition is from the early sixties. The Lance system is from the early seventies. There have been many technological advances that we need to take advantage of.

Some of the advances are in accuracy; others are in range. Improved range allows us to execute the strategy better. The combination of better range, improved accuracy, and decreased prepare-to-fire time improves the survivability of the weapon, and allows us

to execute the strategy with fewer warheads. Modernization is the reason for the reduction in the warhead requirement explained by Mr. Joseph.

We are in a period of great opportunities, but also of great risks. We need, in my judgment, to stay the course. If there was ever a time to be consistent in our adherence to the strategy, to include maintaining the capability to execute that strategy, it is now.

We have the Soviets where we want them, and we certainly do not want to make any errors at this point. We are going to need nuclear weapons in the theater across the spectrum of capability for as far in the future as we can see.

Finally, although the focus of this hearing is on nuclear forces, clearly the conventional element of theater capability is very important as well, particularly with the prospect of a conventional force reduction.

If we are going to be small, we had better be good.

Sir, that completes my statement.

[The prepared statement of General Leland follows:]

STATEMENT BY

LIEUTENANT GENERAL E.S. LELAND, JR.

CHIEF OF STAFF, UNITED STATES EUROPEAN COMMAND

Mr. Chairman and members of the Committee, on behalf of General Galvin, I am pleased to have the opportunity to participate in your review of the important issues associated with theater nuclear forces.

Prior to discussing these issues, it may be useful for me to review briefly some key aspects of our command. The U.S. European Command is responsible for U.S. military activities in NATO Europe and most of Africa - a total 77 countries. General Jack Galvin, our Commander-in-Chief, commands approximately 326,000 in-theater U.S. forces to meet his primary mission of deterring war. He is also the Supreme Allied Commander, Europe (SACEUR), responsible to the North Atlantic Treaty Organization. As SACEUR, he defends Europe by employing the military forces of Allied Command Europe, which include the U.S. forces in and reinforcing Europe. He commands the theater from his headquarters near Mons, Belgium, while his Deputy Commander, General Richards, and I operate from the U.S. Headquarters near Stuttgart, Germany. As Chief of Staff of the U.S. European Command, I assist them in managing day to day activities within our area of responsibility.

The area with which we are charged is an important one. Arises in other areas may frequently divert our attention, but for the foreseeable future, Western Europe remains a geostrategic center crucial to the United States. The security of Western Europe constitutes a vital interest of the United States. Shared values, proximity of the Soviet challenge, and economic interdependence underscore the importance of collective defense epitomized by NATO.

If deterrence fails in Western Europe, U.S. and Soviet troops would be in direct conflict, and this situation will not change

even if the President's force reduction proposals are implemented.

By joining with our NATO allies, we have been able to contain the Soviet threat. Our collective readiness and resolve, firmly rooted in enduring common values and objectives broader than just protection from war, have preserved the peace in Europe for over forty years. Indeed, that very success is now yielding an unprecedented opportunity as both NATO and the Warsaw Pact seem willing to seek enhanced security at reduced force levels.

The future, while promising, is uncertain. Soviet reform is complex and may be long in coming. And Soviet military production continues at a puzzlingly high rate. Prudent caution should be our watchword. To take advantage of the current opportunities requires a willingness to engage in substantive arms control negotiations coupled with consistent adherence to the existing NATO strategy.

NATO STRATEGY

NATO remains a defensive Alliance, with a deterrent strategy. NATO's strategy of flexible response and forward defense seeks to deter any possible attack, ranging from minor incursions to all-out nuclear war. The strategy provides a range of responses to military aggression against members of the alliance.

NATO's preferred response, should deterrence fail, is direct defense -- defeating the attacker or placing the burden of escalation on him. NATO is also prepared to resort to deliberate escalation, to include the first use of theater based nuclear weapons. NATO refuses to rule out the first use of its theater nuclear weapons because such a policy would significantly reduce the risks to aggressors. The ultimate guarantor of alliance deterrence is general nuclear response. The independent nuclear forces of the United Kingdom and France also contribute to

deterrence by complicating the planning and risk assessment of a potential aggressor. Thus, flexible response confronts the Soviets with the possibilities of conventional response, theater nuclear response, and the limited or massive use of strategic weapons against the Soviet homeland. Flexible response presents the Soviets with potential costs that far outweigh any gains that might be achieved through aggression.

Successful execution of NATO's strategy requires an effective balance of modern conventional and nuclear forces. The deterrent strength of the Alliance's forces does not lie only in the separate contributions of these components, but also in their synergistic effect. Diminishing the capability of any one element inflicts double harm. On the one hand, it degrades NATO's ability to respond to a particular threat. On the other, it risks placing on the remaining elements a burden greater than they can bear, undermining the viability of the entire strategy.

FACTORS OF DETERRENCE

Deterrence is founded in a number of interrelated factors. First is the clear understanding by the Soviets that, with absolute certainty, a conventional or nuclear attack on Europe risks the engagement of the strategic nuclear systems of the United States. The vital interests of the United States would be so threatened that the Soviets should not have, and have not had, any doubts about our intentions.

Second, deterrence is founded in our strategy of flexible response, which confronts the Soviets with risks as open-ended as those they pose for the theater. NATO does not have to choose between failure and all out nuclear exchange. NATO's strategy is not merely a declaration of intent; it has the conventional and theater nuclear forces properly organized, trained, and equipped to execute that strategy. The forces and strategy are credible. NATO will employ theater nuclear weapons when necessary to defend

itself. The Soviets face a variety of appropriate responses to their potential aggressions; their planners cannot count on a quick victory or a prolonged campaign without the clear risk of escalation to a nuclear engagement.

Importantly, the NATO strategy of flexible response is carefully linked with our national doctrine of flexible response as well. The seamless cloth of strategic and theater nuclear doctrine is manifested in the forward stationing of U.S. nuclear forces in Europe. These front-line, often dual-capable forces, are a highly visible coupling between our various conventional and nuclear response options.

THEATER NUCLEAR FORCE MODERNIZATION

Deterrence also stems from the very existence of a highly ready, modern, theater nuclear force. The President's budget supports the kind of capability we need in order to remain credible. The F-15E dual capable aircraft, the Short Range Attack Missile-Tactical (SRAM-T), the Follow-On-To-Lance (FOTL), and the Artillery Fired Atomic Projectile (AFAP) all make positive, immediate contributions to deterrence. Their presence does not mean that the U.S. desires to engage in nuclear war, or that we feel that nuclear wars are "winable." On the contrary, this force structure is needed to deter both conventional and nuclear war. If we are to have a credible means to deter further escalation of a conflict once it has started, our senior leaders must have options short of strategic exchange. At the same time, NATO's unilateral decision to reduce its inventory of nuclear warheads by 2,400 since 1979 demonstrates our determination to keep nuclear forces at the minimum level required for deterrence.

Theater nuclear forces are operationally flexible and allow for a spectrum of options. The need for a modern theater nuclear

force is made all the more clear by our serious consideration of force reductions. We should not expect our remaining forces to sustain deterrence with an aging capability against an adversary who is continually modernizing his forces.

The Soviets have been modernizing their theater nuclear forces including short range nuclear forces (SNF) for 10 years. They are, for example, substituting the SS-21 for the FROG; there are twice the number of SS-21s in Europe as there were when President Gorbachev took power. They have improved the range and accuracy of the SCUD. They have also modernized their nuclear capable artillery, as we have partially. We both have modernized our dual capable aircraft. Now that they appear to be satisfied with their modernization efforts, they cry foul at NATO plans to replace one system - the Lance. We do not necessarily have to match them upgrade for upgrade, but we must maintain a modern, credible force.

The FOTL program is one of especially high visibility at this time. From a military perspective, Follow on to Lance is a straightforward operational requirement. The current Lance is not as accurate, survivable, or reliable as we need. A second Service Life Extension Program would be both uneconomical and not meet our operational requirements. Operationally, we need a modern FOTL as fast as programmatically possible.

Neither the unilateral reductions announced by the Soviets and other members of the Warsaw Pact, the initial NATO arms control proposals, nor the President's latest initiatives reduce the requirement for NATO to have modern, highly capable theater nuclear forces. If we are to maintain a responsive and credible deterrent against the eventuality of war in Europe, we must have theater based nuclear weapons. Theater nuclear weapons deter conventional, chemical/biological, and nuclear attacks upon our NATO allies and our own forces deployed in their defense.

A CHANGING LANDSCAPE

NATO has been an effective alliance in part because it has adapted effectively to changes in threats and capabilities. In this vein, the President's significant expansion of the NATO proposal to reduce combat forces from the Atlantic to the Urals offers the chance to balance opposing forces rationally and to greatly increase stability. If both sides make the reductions proposed by the President, and if theater nuclear force modernization goes forward as planned, NATO's strategy of forward defense and flexible response remains viable.

The details of the actual forces to be withdrawn need to be worked out at the negotiating table and we recommend forbearance in this respect. We should not unilaterally reduce our forces, and we should take care to avoid sending signals that a given force is available for reduction for purely budgetary reasons.

The envisioned force reductions do not reduce NATO's need for a modern theater nuclear force. NATO nuclear forces exist for a variety of reasons other than offsetting Soviet conventional strength. The forward deployment of nuclear capable forces demonstrates a commitment to the defense of Europe, protects our own forces, and provides for allied participation in nuclear decisions and operations. Theater nuclear forces also serve as an explicit link between conventional and strategic nuclear responses, help to deter Soviet use of its theater and theater-targeted national nuclear forces, and provide a set of warfighting options that create a realistic deterrent. The ultimate purpose of theater nuclear weapons is political -- to provide to friend and foe alike a highly visible, binding symbol of our commitment to peace.

Even in a post-CFE environment, theater nuclear weapons will be required for the foreseeable future. The Alliance has

prudently agreed to enter into negotiations for a partial reduction of theater nuclear missiles to equal and verifiable levels only after the successful implementation of negotiated conventional force reductions.

Although the focus of these hearings is on theater nuclear and arms control issues, I would emphasize the expected logical results of the President's initiatives, at least from a field command's point of view. Whatever forces remain in theater must be maintained at the highest state of readiness, in good facilities, and in possession of modern weapons and munitions. Additionally, our strategic lift must be capable of rapidly reinforcing the in-place forces. Until a successful force reduction, and after one as well, the conventional elements of NATO's forces can give the alliance a convincing basis for deterrence. The stronger our conventional forces, the less likely will be the necessity to escalate to nuclear weapons. And strong conventional forces signal that the alliance is resolved to defend itself across the spectrum of conflict. Strong conventional forces also make deliberate escalation more feasible - by providing time for political consultation - and thus are more credible.

CONCLUSION

We are possibly on the threshold of an era of historic change that offers an opportunity for a more secure Europe. It is important that we not forfeit that opportunity by succumbing to seductive pressures for rapid relaxation of our security. Instead, we should move as an Alliance with proposals based on the sound principles of strength and negotiations. In that context, the Alliance has again rejected the notion of a third zero - a nuclear free Europe. It has also reaffirmed the need for us to update nuclear forces in Europe, to include ground launched missiles. The Alliance has expressed a willingness to enter into negotiations concerning a partial reduction in SNF

after the implementation of a successful conventional arms control agreement has begun. This is an especially useful approach because it allows us to measure compliance with the conventional agreement as we negotiate the nuclear issues and gives us a way to balance the transition among the various force structures. And it reflects the principles that have preserved the peace in Europe for 40 years.

The U.S. European Command supports a comprehensive package of asymmetrical reductions of the preponderant Warsaw Pact conventional forces, stability measures leading to parity of military capabilities, and a comprehensive monitoring regime. The Command specifically seeks four objectives. First, to establish a more secure and stable balance of conventional force capabilities at lower levels. Second, to maintain undiminished NATO security throughout the negotiation and reduction process. Third, to maintain Alliance unity. And fourth, to permit NATO modernization and restructuring.

The INF treaty was a success because we negotiated from a position of strength, a lesson we should heed in addressing the conventional balance. NATO's dual-track strategy of deployment and negotiation worked. Similarly, we should continue the forward deployment and modernization of our forces in Europe while negotiating their possible reduction. The forward deployment of poorly equipped forces at low states of readiness would have the consequence of undermining the entire negotiations process. The quality of the forces in Europe will directly affect the quality of the conventional arms control agreement we are seeking.

We sincerely hope the Soviets are responsive to NATO's vision of a more secure Europe. As we transition between the force structure now in place and that envisioned by the Alliance, NATO will have to be especially watchful and never allow itself to be trapped in a period of inferiority. We must, as General Galvin has often pointed out, keep our powder dry. We should be

cautious of becoming victims of our own hopeful thinking. We still face a formidable and essentially unpredictable military power, and we will continue to do so even if the President's initiatives agreed upon in Vienna and implemented.

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Senator EXON. Thank you very much.
General Chen.

STATEMENT OF BRIG. GEN. WILLIAM S. CHEN, U.S. ARMY, ASSISTANT DEPUTY FOR SYSTEMS MANAGEMENT TO THE ASSISTANT SECRETARY OF THE ARMY FOR RESEARCH, DEVELOPMENT AND ACQUISITION

General CHEN. Sir, I would like to summarize the Follow-On To Lance program by covering the acquisition strategy, major events and milestones, and then review where we are in the program for fiscal years 1989, followed by summarizing the fiscal years 1990 and 1991 activities associated with our fiscal years 1990 and 1991 budget requests.

The acquisition strategy is the competitive development of the Follow-On To Lance missile and system integration. The competitive strategy provides a broader range of solutions because no current system meets the requirements. The full-scale development effort will be no more than 48 months. The development contract includes production options which permit concurrency to accelerate fielding.

Competition is limited to U.S. prime contractors because of the restriction on release of nuclear design information.

Major events in the program include approval of a mission need statement by the Department of Army in November of 1987, the Department of Defense program go-ahead approval in August 1988, and approval of the MLRS launcher selection as the Follow-On To Lance launcher in December 1988.

Major program milestones are the planned release of a draft request for proposal to industry in the third quarter of fiscal year 1989 and release of the final request for proposal following an Office of the Secretary of Defense Strategic Systems Committee review in the first quarter of fiscal year 1990.

The plan is to enter full-scale engineering development in the third quarter of fiscal year 1990. Low rate initial production is planned for the second quarter of fiscal year 1993, subject to competitive proposals to be submitted.

I would like to now summarize our fiscal year 1989 activities. We are conducting trade-off analyses, risk analysis, and developing the best technical approach to determine the system specifications. We are also preparing the program documentation and preparing the draft request for proposal.

The Phase Two warhead feasibility study is complete and in fact is being presented to the Nuclear Weapons Council today. Upon approval, the Phase Two A design definition and cost study will be initiated.

Our fiscal year 1990 budget request is for \$32.8 million. Our activities will include release of the competitive request for proposal, conduct of a source selection, continuation of the Phase Two study, and then entry into full-scale development. A budget reduction would jeopardize the initial operational capability.

During fiscal year 1991, we will conduct a preliminary design review, initiate the prototype build, and a critical design review will also be conducted, as well as continued producibility and logistics analysis.

Research, development, test and evaluation funding continues in fiscal years 1992, 1993, and 1994. The total development cost is estimated to be \$368 million. Procurement funding begins in fiscal year 1992, with long lead items procurement to support the initial operational capability.

In summary, the Follow-On To Lance program would use an accelerated acquisition strategy with full and open competition for development of a new nuclear missile. The selected contractor will be awarded a full-scale development contract which will include not-to-exceed production options.

A contract award in fiscal year 1990 is essential to meet the initial operational capability. The initial operational capability is also necessary to support the replacement of the aging Lance nuclear missile.

Follow-On To Lance will provide improved range, accuracy, and survivability and will restore the declining deterrence of Lance. Follow-On To Lance will also increase the conventional war-fighting capability by replacing four battalions of nuclear-only Lance with four dual-capable MLRS battalions.

Sir, this concludes my remarks on the Follow-On To Lance program.

Senator EXON. General, thank you very much.

Let me begin the questioning. I would ask the clerk to adhere to the regular time rule so we can move the meeting along.

There are going to be an awful lot of questions for this panel and under the time constraints that we have, we are not going to be able to get into everything; and I will start out by saying that when we finish today, that questions will be submitted by myself and other members of the committee for the record. I would request a very prompt reply so we can get them in as part of the record.

NUCLEAR DEVICES IN NATO

General Leland, I listened with great interest to your comment when you said, as far as we can see into the future, we are going to need some different types of nuclear devices in NATO. Is that a fair summation of what you said?

General LELAND. Yes, sir.

Senator EXON. Well, I would agree with your comment. The problem I see is that I am not sure our NATO allies agree with the statement that you just made, and I am wondering what your response is to that. I find anti-nuke sentiment sweeping over Europe to the extent that we are taking a rather wimpish approach by saying we will see what we can do, maybe we can get some stand-off facilities at sea or in the air, anything to get nuclear weapons out of Europe.

Do you believe the statement that you just made, that we need nuclear forces of some type, maybe all types, in Europe, on European soil, is ever going to be accepted by the Europeans?

General LELAND. Sir, I will respond to that. I would also ask Mr. Joseph to comment when I am finished. I would tell you from the soldier's view—

Senator EXON. Would you speak up, please.

General LELAND. Yes, sir.

I will tell you from the soldier's view that I was very impressed with the consensus that came out of the Summit—

Senator EXON. I am sorry, I just cannot hear you. There are conversations on both sides of the chairman and you are not talking loud enough. I would like to have the conversations cease so I can hear what you are saying.

General LELAND. Sir, it is my fault. I will speak up.

From a soldier's perspective, I was very impressed with the consensus that came out of the Summit. Before the meeting, I was certainly concerned. I know General Galvin was as well. I believe a lot of people were.

But the Alliance has demonstrated one more time that, even though we have 16 sovereign nations, a united view on tough political issues is possible. Such cohesion is why the Alliance has worked.

Although there are going to be tough issues in the future, I do not see anything that makes me believe we will not end up doing the right thing.

Senator EXON. That is a pretty generalized statement, but maybe you can clarify it, Mr. Secretary.

I guess I am saying that you people come here and make all kinds of suggestions that I agree with, but I do not see at the present time how we are going to, if we have all the nuclear forces we want in artillery or cruise missiles or short-range nuclear weapons as a Follow-On To Lance—where we are going to base them. Maybe in England. Where else?

Mr. JOSEPH. Sir, if I may respond. I would point out that in almost every communique, not just by Defense Ministers but by Foreign Ministers, as well as by Heads of Governments—and we saw this at the Summit last month—we have received an endorse-

ment for the requirement to maintain an effective, responsive, and survivable nuclear force posture in Europe.

If you look at the comprehensive concept that was published at the Summit last month, the focus was clearly arms control, but the issue of a requirement for nuclear forces was covered. And what it said I think should be very encouraging, because it says that there will be a continuing requirement, not only for air-launched, but also for ground-launched systems, across the spectrum of ranges. I think that is a good endorsement.

[Deleted.]

But I think the Alliance in general and the governments that are most concerned have been responsible in acknowledging the requirement and encouraging the United States to continue the development of even the most controversial systems, such as the Follow-On To Lance. And not only in the private agreed minutes from NATO meetings, but also in the public communiques. I find that very encouraging. And let me assure you that we have been working very hard to ensure that the Alliance does achieve what it requires, and that is a credible nuclear deterrent posture in the future.

Senator EXON. I hope you are more successful in getting that done——

I will recognize you right away, Senator Thurmond. I know you have some commitments.

My point is, I hope you are more successful in getting that done than you were in convincing the West German Government that we need not only modernization, but some type of defense for chemical weapons, when the facts of the matter are we are going through with a wholesale pullout. I hope you will be successful.

I am not so sure we are moving down the right track.

I will be glad to yield to Senator Thurmond.

Senator THURMOND. I am a member of the Constitutional Commission and I am going to have to leave in about 6 minutes.

Mr. Chairman, I would join you in extending to the witnesses a warm welcome, and I look forward to their testimony. I will have to read this testimony later.

FOLLOW-ON TO LANCE MISSILE

The subcommittee is most fortunate to have the opportunity to hear their expert assessment on the political and military situation of NATO and for the theater nuclear modernization. The major program issue in the area of theater nuclear modernization is of course the Follow-On To Lance missile system.

For different reasons, this program has come under heavy criticism by both the West Germans and the Soviets. Soviet objections to NATO short-range nuclear modernization, or SNF, is predictable. They are opposed to any program that enhances the credibility of NATO deterrent forces. Soviet objections are particularly disingenuous, however, given the backdrop of their own theater nuclear modernization programs since 1980.

The respected defense analyst Philip Karber recently testified before the committee that during the 1980's the Soviets have mod-

ernized and increased their nuclear-capable aircraft by some 163 percent. Do you agree with that?

Mr. JOSEPH. Sir, I certainly agree that the Soviets have undertaken a very ambitious, very aggressive modernization program, including with regard to its strike aircraft.

Senator THURMOND. Nuclear-capable artillery has increased [deleted], and surface to surface missiles, or SSM's, increased [deleted]. While Soviet SSM's increased [deleted], it is important to keep in mind that [deleted] the SSM force was modernized with newer SS-21 and Scud-B systems.

The Soviet SNF buildup and modernization program is indeed disturbing. Equally disturbing is West German resistance to carry through with agreed-upon NATO SNF modernization plans, specifically the Follow-On To Lance missile.

During the ratification of the INF Treaty, virtually every witness who appeared before the committee stated that their support for the treaty was contingent upon the implementation of the 1983 Montebello Decision regarding NATO nuclear modernization. Administration witnesses testified that Follow-On To Lance was a critical component to the nuclear modernization program.

Indeed, it was often stated that stability and deterrence could only be buttressed by the modernization and deployment of these systems.

West Germany should clearly understand the importance of the Montebello Decision. Indeed, West Germany has been a full participant on all past NATO nuclear modernization decisions and has publicly endorsed the recommendations of the Alliance regarding the necessity to maintain a modern and credible nuclear deterrent.

This is not the time to reverse this successful strategy. The Alliance must continue to support nuclear modernization, and in particular Follow-On To Lance. If we fail to resist pressures to eliminate short-range nuclear missiles like the Follow-On To Lance, how can we expect to resist the next step, which would be calls for the elimination of artillery, and air-based nuclear systems, culminating in no nuclear deterrence in Europe?

History shows that conventional deterrence fails to increase stability. On the other hand, nuclear deterrence has been the primary factor for the peace in Europe for over 40 years.

Militarily, the Warsaw Pact threat has changed only on the margins, if that. In fact, the threat has increased in many areas of theater nuclear delivery systems. Politically, it is too early to consider major changes in our NATO military strategy.

The outcome of declared military reforms and intentions has not been determined. The Soviets still have not matched words with deeds. Soviet military production continues to be at a very high level, including the area of nuclear weapons delivery systems.

The United States and the Alliance must remain strong so that we may negotiate from strength. Such a posture is necessary if we are to negotiate a conventional arms treaty that is both effective and stabilizing. As President Bush has stated, we must ensure that any negotiations over short-range nuclear systems be limited to partial and verifiable reductions to equal levels of missiles on both sides.

Anything short of that will in my opinion bring into question the future and integrity of the NATO Alliance.

Again, I want to welcome the distinguished guests here, and I am sorry I have to leave for this other appointment.

Mr. Chairman, I thank you very much for your courtesy.

Senator EXON. Thank you very much, Senator.

Senator Nunn.

Senator NUNN. Thank you, Mr. Chairman.

GERMAN MANPOWER REDUCTIONS

General, I want to get on another subject just briefly and then come back to the nuclear issue. I know you have a broad view. I have been informed in recent days that the Germans are projecting, planning, and budgeting in their own army for very substantial manpower reductions over the next 2 years.

Am I correctly informed? Whether I am or not, could you tell us what the German forces are planning in the next 2 years, considering they are phasing out or phasing down the length of the draft and so forth, manpower-wise?

General LELAND. Yes, sir, I can outline that for you. They are facing a reduction in their military age population as I am sure you are well aware and they have a conscripted army.

The term of service of 15 months was to be extended to 18 months. The German Government was prepared to extend the service and then they decided not to make the change. The announced reason was they had found other ways to take care of their shortfall, but I do not know what they are. There clearly was substantial political pressure not to proceed with the extension.

Even if they had increased the length of service, that alone would not have enabled them to man the force that is currently in being. Consequently, they have a plan that restructures their armed forces.

They are going to put major pieces of active component divisions into the reserves. There will be a smaller active component.

Senator NUNN. About how much?

General LELAND. Sir, I do not recall exactly.

Senator NUNN. Could you furnish for the record how much the German Federal Republic is planning on reducing its manpower over the next 2 or 3 years?

General LELAND. Yes, sir.

[The information follows:]

Members of NATO commit forces to the Alliance annually as part of the Defense Planning Questionnaire process. Nations contemplating changes in commitment or readiness and availability of forces consult with the allies before implementing changes. This year's response is due at the end of July. [Deleted.]

Senator COHEN. If you would yield, Sam. It sounds like they are putting into place Secretary Lehman's proposal of shifting active forces to the reserves.

Senator NUNN. Well, I am profoundly disturbed. Here we are implicitly saying we are going to keep our manpower levels right where they are right now, in spite of the fact our force posture is coming down and we know that. We are saying we are going to keep it where it is until we achieve conventional arms control re-

ductions, which I think is a sound position if the Alliance as a whole takes that position.

And we are saying, when the Alliance does get these reductions, we will take 35,000 out.

[Deleted.]

I would like to know, without any sugar-coating, what the Germans and what the other allies are projecting for the next 3 years in terms of manpower for NATO.

General LELAND. Sir, I will provide that.

Senator NUNN. It is an absurdity, if we are locked into this position with 315,000 or 320,000 troops over there and we are subjectively putting ourselves in a 275,000 posture sort of indefinitely—I do not know how long that will last—by saying we will come down to that level.

We know it will take 2 or 3 years to negotiate that and 3 or 4 to implement it with the Soviets' reductions. So I am very disturbed by that, and I would like, before I strike out on this subject in one way or the other, I would like to know what the figures are, just hard, cold facts about what the other NATO countries are going to do with manpower in the next 3 years.

General LELAND. Sir, I understand your question.

MODERNIZING LANCE

Senator NUNN. Let me ask you another question. Secretary Joseph, Mr. Volker Ruhe, who is one of the leading defense experts in the Christian Democratic Party in Germany, said recently he could not foresee any situation in which we can agree to modernize Lance. Those are his words.

In light of that statement, and the overall German political climate why should the Congress continue to provide funds for the modernization of Lance? What are we going to say on the floor when somebody stands up and says, let us save the money here because it is not going to be deployed anyway?

What is the answer to that?

Mr. JOSEPH. Sir, I think my answer to that is that recognizing there are political problems that exist in West Germany and in other NATO countries as well, there is still the requirement. The Follow-On To Lance will play a key role in the nuclear deterrent posture in the future, and that is the best judgment of NATO military authorities.

I think that just as we did in INF, we must as a Nation demonstrate our leadership of the Alliance. [Deleted.]

Senator NUNN. Well, the German elections are in late 1990, and NATO is now saying that we are not going to decide about whether to replace Lance with the Follow-On To Lance on German soil, until 1992; 1992 is 2 years after the 1990 German election.

Why wait 2 more years to make a decision on Lance?

Mr. JOSEPH. Well, we know we have a requirement for the Lance Follow-On. The Lance that is currently deployed does not meet the requirement; it is an aging system, whose life we have already extended once before.

I think the argument of delay is one that can be used not just now, but in 1991 and in 1993. I believe that, given the requirement,

given our leadership of the Alliance, that we really must move forward.

And again, I would point out that in the context of formal statements by the Alliance, both public and private, we have been encouraged by the responsible line that the Alliance has taken. They have as a corporate group recognized the requirement, endorsed the U.S. efforts to develop the Lance Follow-On, and have indeed stated that the Alliance will require effective ground-based nuclear forces.

And if we do not move forward with the Lance Follow-On, we will achieve what I know we all in this room want to avoid, and that is the third zero, through obsolescence.

Senator NUNN. What is the total figure we are going to be asked to authorize between now and 1992, for the Follow-On To Lance, the time when we will know NATO's decision about whether or not to deploy Follow-On To Lance? What is the amount of money?

Mr. JOSEPH. Sir, I would look to General Chen for the answer on that.

General CHEN. Our budget estimates for fiscal year 1989 through 1991 total about \$169 million.

Senator NUNN. Would it not really be between now and 1993?

General CHEN. For 1992 that would be another \$121 million in RDT&E.

Senator NUNN. So you are talking about how much total?

General CHEN. We are talking close to \$300 million for development between now and the end of 1992.

Senator NUNN. Have you got a fallback, slowdown position on the Lance Follow-On? Can you keep the program alive, but slow it down, save some money until NATO makes a decision on deployment?

I will tell you why. I agree with everything you all have said about the importance of Follow-On To Lance, but I am not hearing from anyone—no one—that Follow-On To Lance is ever going to be deployed.

Four, five, or even six months ago, I was hearing, give the Kohl government a chance, let it get through the 1990 elections, we will have a wink until then, everything is going to work. I am not hearing that lately from anybody, not privately from German military people, and not from German politicians of any party.

All I am hearing is an adamant view that no government in Germany can survive, whether it is conservative or not, with deployment of the Follow-On To Lance. Now, maybe you all are hearing something different. Maybe somebody is winking at you. They are not winking at me any more.

I am not saying I think that it would be a mistake to cancel the program, what I am saying is when you get down to \$300-something million in this kind of budget situation, a program slowdown sounds reasonable, whether you are for it or against it.

What is a funding profile for the next 4 years that would reduce the level of funding, but keep the program viable?

Mr. JOSEPH. Sir, if I could answer that from a policy perspective—

Senator NUNN. I want the dollars anyway, whether you agree with the policy or not.

Mr. JOSEPH. Senator, I am unaware of any fallback position that would provide for a slowdown.

Senator NUNN. Well, you better come up with a fallback position, unless you want it to be dreamed up in the Congress. I may not be in favor of it myself, but I think that we are not going to put up \$300-some million while everybody in Germany says it is never going to be deployed.

Mr. JOSEPH. [Deleted.]

And in fact we did get zero.

Senator NUNN. You mean zero in INF?

Mr. JOSEPH. Zero in INF.

Senator NUNN. That is one of the things stuck in their craw, too, right now. That has a lot to do with some of the politicians' views on Follow-On To Lance. They think that the zero INF was a fundamental error.

Mr. JOSEPH. Well, many of these same individuals were of course completely supporting the zero position in INF at an earlier time, before we had the INF agreement.

Senator NUNN. I am sorry?

Mr. JOSEPH. Many of the people who are now saying that the zero solution in INF, the zero-zero outcome in INF, was a mistake were the very people who were supporting the zero solution to INF before the treaty.

Senator NUNN. There are some of those, but there are also a lot of them who said they did not want zero back then, too. I know many top Government officials who were adamantly opposed to zero, and we sent people over there to force that position down their throats.

Nevertheless, we better get some funding profiles that are of a lesser amount, that we can at least have a look at.

Mr. Chairman, I know my time must have expired.

Senator EXON. Thank you, Senator Nunn.

I recognize Senator Cohen.

I just want to add a caveat to the reply that you gave, Mr. Secretary, to one of Senator Nunn's questions. I believe you said something to the effect that all the responsible military leaders in NATO assure you this, that, or the other thing. The problem is that I am concerned about the fact that the military leadership of NATO are not speaking for the political leadership of NATO.

Certainly, we should learn something by what has happened in the last few years.

Senator NUNN. I am no longer hearing it from the military people privately. I am hearing just the opposite from the military people. I am not talking about—

Senator EXON. Well, I am going to have a second round. We will get into it a little bit more. I do not want to delay.

Senator COHEN. I am just going to follow up on some of the same issues.

Senator EXON. Well, go ahead and respond to the question that has been raised, then.

Mr. JOSEPH. Sir, maybe I was not sufficiently clear, and I apologize for that. But the endorsement of a credible, effective, survivable nuclear posture in Europe is not limited to NATO's military authorities. But as I pointed out, the political side of the house—

Senator COHEN. Give us an example? Give us an example of who you are talking about.

Mr. JOSEPH. Well, I can give you many examples if you consider Defense Ministers to be political authorities. I can give you examples of Foreign Ministers as well as the Heads of Governments.

Senator NUNN. They are not going to be deployed anywhere but in West Germany, so tell us about who in West Germany.

Senator EXON. Mr. Kohl?

Senator NUNN. I mean, it does not do much good for us to say Mrs. Thatcher is for deployment of Follow-On To Lance.

Mr. JOSEPH. Sir, I cannot give you a specific endorsement of the deployment of a Follow-On To Lance. What the government leaders, including Mr. Kohl, have said in the context of the comprehensive concept and in the NATO Summit declaration is that NATO will continue to require nuclear forces that will be kept up to date where necessary.

We have not asked for, given the step-to-step approach that the Alliance has adopted, a specific endorsement of or a deployment decision for the Follow-On To Lance program.

Senator NUNN. Mr. Joseph, if I could, everybody sitting at this table knows that the West Germans—and you know it, too—believe that the phrase “keeping up to date” is not the same thing as a Follow-On To Lance. They fundamentally believe a Follow-On To Lance is a different system. They do not believe that language in any way even covers the Follow-On To Lance.

I know that, you know that, everybody knows that, it is being talked about publicly. Now, who are we trying to kid?

Mr. JOSEPH. Sir, I am certainly not trying to kid you and I am not trying to in any way underestimate the political differences and political difficulties with the deployment of any new system to Europe, any new nuclear weapon system to Europe.

We saw it in INF. We are going to see it in the Follow-On To Lance. We are seeing it with regard to the Follow-On To Lance. And we will see it with other systems.

I am not trying at all to underestimate the problems that exist politically. But what I would very much caution against is, because of the perception that these political difficulties exist, we need to slow down the program. I think the best exercise of our leadership in the Alliance would lead us to the conclusion that what we need to do is go forward with the Follow-On To Lance program and the other modernization programs.

Senator EXON. Senator Cohen.

Senator COHEN. Well, if I can just pick up on a theme that has been articulated here. I think that some ambiguity is obviously desirable in diplomacy, but it can also lead to some self-deception. And the kind of self-deception we have had is, as Senator Thurmond mentioned, at Montebello we were in complete agreement, at Montebello, the 1987 foreign ministers agreement, complete agreement on that.

And no matter what the words say, the political dynamism takes over in West Germany and they start to step away from it. So even though you have this agreement in Brussels now, no matter what the words say, already you have people making statements that are somewhat ambiguous.

AIR-BASED/SEA-BASED SYSTEMS

Just for the record, as far as the Brussels agreement the following systems are not subject to negotiation: air-based, sea-based systems. They are not subject, right?

Mr. JOSEPH. Yes, sir. The comprehensive concept identifies only U.S. and Soviet land-based short-range nuclear missile forces.

Senator COHEN. Right. Air-based and sea-based are not subject?

Mr. JOSEPH. Yes, sir.

Senator COHEN. Non-missile systems, such as nuclear artillery, are not subject to negotiation under that agreement?

Mr. JOSEPH. They are not identified under that.

Senator COHEN. Right. That means that they are not subject to it, right?

Mr. JOSEPH. In my view, I hope they do not become subject to it, sir. I cannot tell what will be subject to negotiations in the future.

Senator COHEN. Okay. How about non-U.S. systems, such as French land-based systems?

Mr. JOSEPH. They are not covered.

Senator COHEN. They are not going to be the subject of negotiation under the Brussels agreement?

Mr. JOSEPH. That is correct.

UPGRADED LANCE

Senator COHEN. Okay. Now, Senator Nunn was talking about the upgraded Lance. I will tell you this: If Volker Ruhe says it is not going to be deployed, I have not found anybody to his right that is coming out in favor of deployment of Lance. He is about as far over as you are going to get and a responsible legislator, and if he says it is not going to happen I cannot find anybody over there who says it is.

Now, when you go to a NATO meeting or go to a meeting of NATO defense ministers in Munich and see Egon Bahr arm in arm with Alfred Dregger, you know you have a problem, you have a serious problem. I never thought I would see that happen, but it has happened.

So I am not at all sanguine about the prospects of the Follow-On as far as Germany is concerned. We even had Manfred Woerner a couple of years ago, and this committee has been carrying the water as far as getting chemical weapons, the binary system, funded. [Deleted.]

So we have been able to at least get around that for the time being by pointing out that chemical weapons are not solely deployed in Europe. It may be—I do not know this, but it may be—that the Lance is not solely deployable in West Germany. The upgraded Lance could perhaps be deployed, in South Korea, to the extent we are going to stay in South Korea, or perhaps some other areas of the world. It seems to me that we are going to run into one hell of a problem if we say that the Lance is designated solely for deployment in West Germany, at a time when almost all of the public figures, right and left, are saying under no circumstances is upgraded Lance coming in.

If you have a rationale that extends it beyond Germany, I think that that may be a way to deal with that. But I would suggest to

you it is not going to be sustained over here unless you find another rationale for it other than the potential for persuading the West Germans, yes, you are going to take this particular system.

I would like to just move on quickly to future needs. Statements coming out of Europe right now, for example—you have said that the new comprehensive concept has said that nuclear forces where they are concerned, land, sea, and air-based systems, including ground-based missiles in present circumstances, and as far as can be foreseen will be needed in Europe. That is the statement.

Already, according to reports, Chancellor Kohl has said: "Considering the dynamism of overall developments in the East and West, the 'foreseeable future' can mean a relatively short time."

And then an unidentified West German official is quoted as saying: "Foreseeable future means until 1992."

Now, that is the kind of dynamism politically that is taking place over there. We say for the indefinite future. They are saying for a relatively short period of time. I think that gives us some idea of what we are dealing with as far as the political situation in Europe.

SRAM-T

The final point, General Leland, I want to talk about the SRAM-T. What aircraft are we going to put that on? F-16, F-15? Other 15?

General LELAND. We will put the SRAM-T on the F-15E first, then the F-111, then the F-16.

Senator COHEN. Any non-U.S. aircraft?

General LELAND. It is going to go on the Tornado.

Senator COHEN. Tornado?

General LELAND. Yes.

Senator COHEN. Have you seen the RAND study which suggests that perhaps we ought to put that on the AV-8B in order to reduce the potential for having to deal with attacks on land-based systems in Europe?

General LELAND. Sir. I have not. There is a possibility that General Hall might have.

General HALL. No, sir, I have not.

Senator COHEN. Could you take a look at that.

Senator NUNN. You are talking about putting the SRAM on the AV-8B?

Senator COHEN. Yes, this was the RAND Corporation. They suggested that it would reduce the reliance on NATO's nuclear deterrence as far as vulnerable air bases over there.

Senator NUNN. I endorse that request. I think we are going to have to look for nuclear weapons that can be stationed in Germany, but also outside Germany. We are going to have to look for nuclear weapons that can be moved around, and that probably means by air. And we are going to have to look for ways to make that air survivable and make that weapon where it can stand off and penetrate.

I am not saying we should give up the ship on the Follow-On To Lance. It would indeed be—based on what I see of the political situation—very foolish for our military people to be looking at these

political documents and believe they mean that they really are going to go with Follow-On To Lance, because I do not think that is what they mean at all.

I think we better have some alternative systems or we could be caught in a political-military quandry in a year or two, maybe even sooner.

Senator EXON. Gentlemen, we are an hour and 15 minutes into this panel. We have another panel that I hoped to go to about 10 minutes ago.

I am going to submit a whole series of questions for the record. Are there additional questions of this panel?

Senator GORTON. I will pass.

Senator WALLOP. I will pass at the moment. I would have some questions for the record.

Senator EXON. Just one question that I have of you, General. In a recent interview in Time magazine, General Galvin said: "The Lance will be dead by 1995 unless it is modernized," "There is such a thing as electronic rust. That means that by 1995 you could fire a Lance without enough assurance that it would not be a dud."

What did General Galvin have in mind when he said "unless it is modernized"? Is he holding out that possibility?

General LELAND. No, sir. He is talking about the Follow-On To Lance.

Senator EXON. He is talking about a follow-on and not modernizing the Lance?

General LELAND. Absolutely. He is saying we are pushing the program to get the Lance to 1995, and if we go beyond that point we have a system which is unacceptable in capability.

Senator EXON. Gentlemen, we will have additional questions for the record. We thank you very much for being here this morning. You heard the concerns of this committee and some of the thoughts that are going through our minds. We want to continue to work with you on this, but there are some grave concerns being held over here at the present time.

Please keep up posted and please keep in touch.

With that, this session is adjourned and we will reconvene in one minute with the open session panel that will follow.

[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR SAM NUNN

LANCE DEAD BY 1995

Senator NUNN. General Leland, in a recent interview in Time magazine, General Galvin said, "The Lance will be dead by 1995 unless it is modernized. There is such a thing as electronic rust. That means that by '95" you could fire a Lance without enough assurance that it wouldn't be a dud."

What did General Galvin have in mind when he said, "unless it is modernized." What are the options for modernizing (as opposed to replacing) the Lance and what would they cost?

General LELAND. General Galvin was referring to the FOTL. This theater does not support modernization or another service life extension program for the Lance missile system. The Lance is currently undergoing its second SLEP which extends its operational service life through 1995. Lance is an older weapon system that:

- a. [Deleted.]
- b. [Deleted.]
- c. [Deleted.]
- d. [Deleted.]

EXTENDING LANCE

Senator NUNN. Our committee staff was briefed in February on this by the Army and told it would cost \$164 million to extend Lance from 1995 to 2000. Do you agree with this estimate?

General LELAND. Current estimates are \$279.5 million to extend Lance from 1995 to 2000. These figures do not include manpower costs which add an additional \$246.0 million and O&S costs of \$109.0 million. In addition the cost to our allies would run \$124.4 million for this same time period.

RETIRING OR MODERNIZING LANCE

Senator NUNN. If you had to choose between retiring the Lance without any land-based missile replacement or keeping the Lance but modernizing it, which would you choose?

General LELAND. Forced with this decision, the only viable option to preserve SSM capability and continue nuclear burdensharing would be modernizing the Lance, but that does not alleviate the system's many operational shortcomings. [Deleted.]

ALTERNATIVE LANCE CHOICES

Senator NUNN. If you had to choose between spending money on modernizing the Lance and spending money on alternatives to Lance which were not land-based, such as air- or sea-based tactical nuclear missiles, which would you choose?

General LELAND. [Deleted.]

TROOPS TO MAN MLRS BATTERIES

Senator NUNN. If a decision were made to spend the money necessary to keep Lance in the field beyond 1995 and therefore keep Lance support personnel in place, where would you turn to find the troops you need to man the MLRS batteries?

General LELAND. The question is not an easy one to answer. European Troop Strength (ETS) ceiling is such that any new system fielding requires some other mission to be curtailed. Equipping and manning the force is foremost a service responsibility and we will work closely with the Army staff to ensure MLRS fielding in Europe.

MOVING THE 401ST TACTICAL FIGHTER WING

Senator NUNN. General Leland, the administration has proposed to move the 401st Tactical Fighter Wing from Spain (where it is being kicked out) to Crotone, Italy. It will cost over \$800 million to build a new base at Crotone, with the United States paying over half of that bill. Given the uncertain prospects for the Follow-On To Lance program, does this make it more important to retain this air-delivered nuclear deterrent capability on NATO's Southern Flank?

General LELAND. [Deleted.]

SOVIET MODERNIZATION

Senator NUNN. Secretary Joseph, are the Soviets observing a moratorium on SS-21 short-range nuclear missile deployments, as Foreign Minister Shevardnadze has claimed?

Mr. JOSEPH. While the Soviet Union has announced that they are not modernizing their tactical nuclear missiles, such announcements are misleading given the decade-long Soviet SNF modernization program and the very large Soviet inventory of SNF systems. Throughout the past decade the Soviets have been engaged in a comprehensive tactical nuclear force modernization program. They have replaced a substantial number of older FROG units with the much more accurate and reliable SS-21 missile. In addition, the USSR has been working to upgrade their shorter-range ballistic missile force. Advancements in warhead capabilities, accuracy and reliability are likely improvements. The Soviets have also been reassigning SS-21 battalions from the Army's tank and motorized rifle divisions and reorganizing these missiles into SS-21 brigades at Army-level, in the process increasing the number of SS-21 launchers per Army. This restructuring is nearly complete in the Soviet forces stationed in Eastern Europe. Consolidation of these assets allows the Army commanders greater control over these highly accurate systems and improves targeting response times and flexibility.

TASM

Senator NUNN. Secretary Joseph, funds provided in fiscal year 1989 for the SRAM II program are for advanced development. Funds requested for fiscal year 1990 for SRAM II are for the start of engineering development. The first flight test of the SRAM II is not scheduled to occur until September 1990. Since we are so early in the development phase of SRAM II, how can you productively use \$60 million in fiscal year 1990 on the TASM, now called the SRAM-T missile?

Mr. JOSEPH. By initiating the SRAM-T development program in fiscal year 1990, we can link it to the well-established SRAM II program and achieve subsequent production efficiencies. SRAM II will be at the peak of its R&D in fiscal year 1990 with the missile Critical Design Review (CDR) scheduled to be completed in December 1989. For example, the final chemistry for the solid rocket propellant mixture needs further testing to complete the CDR. During fiscal year 1990, the SRAM II program will start to fabricate test missiles and conduct ground tests, captive carries, as well as launch the first flight test missile in September 1990.

The SRAM II program is a low risk approach; we are building a "state-of-the-art" missile having 20 years of experience with the SRAM A. Therefore, we think the time is right to start SRAM-T development to be able to produce SRAM-T along with SRAM II during Lot 2 production in 1994.

The fiscal year 1990 budget request for \$55.4 million starts the SRAM-T program. The SRAM-T contract for engineering work is expected in February 1990. These funds will be used for engineering design changes to the SRAM II to incorporate a tactical nuclear warhead, add some unique warhead control wiring and develop different operational flight software. Missile design changes are required in fiscal year 1990 to be coincident with the DOE tactical warhead design and development. In fiscal year 1990 we also start the F-15E integration efforts and conduct preliminary design reviews for the missile, unique support equipment and the F-15E modifications. SRAM-T flight tests start in late 1992 and continue into 1994, leading to the production approval in April 1994 and fielding of the first missile in April 1995. Under this plan over 400 SRAM II's will be produced before the first SRAM-T, and 25 SRAM II flight tests before the first SRAM-T flight test. This approach is smart, and SRAM II's current stage of development supports this plan.

FOLLOW ON TO LANCE

Senator NUNN. General Chen, you said that the range of the Follow-On To Lance (FOTL) will be [deleted] kilometers. The INF Treaty bans land-based ballistic and cruise missiles of ranges greater than 500 kilometers. Article VII, paragraph 4 of the treaty says, "The range capability of a GLBM (Ground-Based Ballistic Missile) not listed in Article III of this treaty shall be considered to be the maximum range to which it has been tested."

What is the maximum range to which FOTL will be tested?

What is the maximum range for which FOTL will have a designed capability?

General CHEN. While the Test and Evaluation Master Plan is not yet finalized, the draft of that document calls for approximately one-third of the missile test flights to be conducted at the maximum range of the missile. The Follow-On To Lance will be designed to be fully compliant with the terms of the INF Treaty. It is required to have a maximum range of [deleted] kilometers. It is desired that the missile have a range of [deleted] kilometers. These ranges are stated in the Request for Proposal. The actual range of the missile will be determined by the competitive process, but in no case will it exceed the INF limit. FOTL flight testing will be conducted in such a way as to ensure that the terms of Article VII are not violated.

AFAP

Senator NUNN. Secretary Joseph, you have said that "we will need to lift" the congressional restriction on the production of new nuclear artillery rounds which limits total production of 8-inch and 155mm rounds to 925. When will you need that restriction lifted? Are you asking for it in this year's bill?

Mr. JOSEPH. We would welcome relief this year. The restriction needs to be removed in order to meet CINC requirements and to capitalize on economies of scale and continuity of production.

FOTL WARHEAD

Senator NUNN. Mr. Joseph, in selecting the warhead for the Follow-On To Lance missile, do DOD and DOE plan to make use of the warheads that have been recovered from the Pershing II and GLCMs due to the INF Treaty? If not, will DOE and

DOD be able to certify that the warhead selected is the most cost-effective option, given safety and mission requirements?

Mr. JOSEPH. The Nuclear Weapons Council has completed its review of warhead candidates for the Follow-On To Lance (FOTL). DOE is currently conducting its selection. The ultimate warhead decision will balance the relevant factors (i.e., resources, cost effectiveness, safety, reliability, mission requirements, etc.) inherent to such a decision. This process ensures selection of the best possible choice of warhead options for FOTL. The PII warhead will be converted into another compatible military application. The GLCM warhead is not suitable for conversion into FOTL.

[Whereupon, at 10:45 a.m., the subcommittee was adjourned.]

OPEN SESSION

Hearing Reconvened

The subcommittee reconvened in open session at 10:50 a.m., Senator J. James Exon (chairman of the subcommittee) presiding.

Committee members present: Senators Exon, Nunn, Levin, and Wallop.

Committee staff member present: Lucia M. Chavez, security control officer.

Professional staff members present: Robert G. Bell and Sherri W. Goodman.

Minority staff member present: Brian D. Dailey, professional staff member.

Committee members' assistants present: Jeffrey B. Subko, assistant to Senator Exon; Kenneth N. Luongo, assistant to Senator Levin; Donald D. Mitchell, assistant to Senator Glenn; Terrence M. Lynch, assistant to Senator Shelby; James M. Bodner, assistant to Senator Cohen; Robert M. Soofer, assistant to Senator Gorton; and Eric H. Thoemmes, assistant to Senator Coats.

Senator EXON. I will call the subcommittee to order.

Ambassador Nitze and Dr. Van Cleave, we welcome both of you this morning. We have had a closed session on a whole series of matters and now, as you know, we are in open session. We will hear statements from both of you with regard to our ongoing policy, the authorization bill and how it affects our NATO Alliance and our NATO commitments, and vice versa, our NATO allies' commitments to us, and the whole overall Alliance system.

Both of you have appeared before this committee and the subcommittee previously. We are honored to have you back this morning.

We are wrestling with a very, very difficult situation today. We want your input and advice, and we will have some questions.

Ambassador Nitze, we are very pleased to start with you at this time.

STATEMENT OF HON. PAUL H. NITZE, FORMER SPECIAL ADVISOR TO PRESIDENT REAGAN FOR ARMS CONTROL MATTERS, OF THE PAUL H. NITZE SCHOOL OF ADVANCED INTERNATIONAL STUDIES, JOHNS HOPKINS UNIVERSITY

Ambassador NITZE. Mr. Chairman, it is a pleasure to be here before your committee again. In your letter to me you asked for my views on two issues discussed at the May 29-30 NATO Summit meeting at Brussels. These were the issues of the negotiations with

the FRG on SNF force modernization and the negotiations with the U.S.S.R. on conventional force reductions.

Let me deal first with the SNF force reductions and with the background of that issue. The issue of SNF force modernization first arose in a serious way in the period after 1985 when the Soviets were attempting to return to the INF negotiations after having walked out in 1983.

It became apparent that if the INF and medium-range missiles were removed from Europe, the area threatened by the remaining short-range missiles would be largely restricted to the territory of East and West Germany, and also that this fact would be exploited by the opposition parties in Germany and cause major political difficulties for Chancellor Kohl's government.

At that time I raised the issue with Fred Ruth, who was for many years in charge of arms control policy in the Bonn Government. I went twice to Bonn and asked him whether the FRG would wish us to add to our INF position a proposal for equal ceilings on missiles with a range of zero to 500 kilometers.

It had not earlier been proposed that they be a subject matter for negotiation under the INF negotiations. If such a proposal were accepted by the Soviets, it would prevent either side from having an advantage in this class of weapons and as a consequence undermining the positive results of an INF agreement.

Ruth checked with his superiors, including Genscher and Werner and Kohl, and reported back that they thought that such an additional demand would overburden the negotiations, making it more difficult to get the INF agreement which they very much wanted.

The matter came up again at the time of the NATO foreign ministers meeting 2 years ago. At that time, the ministers laid out the further arms control tasks to be accomplished assuming the ratification and implementation of the INF Treaty.

They agreed we should strive for a START agreement, a global ban on chemical weapons, an agreement to rectify the imbalance in conventional weapons, and, in conjunction with establishing a conventional balance and eliminating chemical weapons, verifiable reductions in U.S. and Soviet land-based nuclear missiles with a range of less than 500 kilometers.

At that meeting Mr. Genscher, the German foreign minister, said that the German Government agreed that all the items on the proposed agenda were important, that he did not object to the inclusion of any of them, but that the German Government did not consider the order of listing to be determinative of the time schedule or order in which NATO should address these objectives.

This foreshadowed a growing political problem in NATO with respect to the treatment of short-range missiles. There was strong pressure in Germany not to modernize U.S. missiles of that range in Germany and certainly not to agree to do so without prior negotiations with the Soviets concerning such missiles.

Let me now turn to the political considerations. By the time the Bush administration assumed office, this issue of what to do about short-range nuclear missiles in Germany had become more serious. Secretary Baker in talks with the Germans insisted that they agree both to the principle that the only short-range missiles we had deployed in Germany, the Lance, be modernized before they became

obsolete, at the latest in 1995, and that there be no negotiation with the Soviets on the subject of such missiles.

The reason advanced for our refusal to hold such negotiations was that, having initiated such negotiations, it would be impossible for us to resist Soviet pressure to agree to the total elimination of such missiles.

Mrs. Thatcher vigorously supported the United States, but most of the continental European members of NATO supported the Germans. Some on the continent took exception to what they called excessive pressure from the "Anglo-Saxons."

As the division between the Germans, backed by the continental NATO countries, and we, backed by Mrs. Thatcher, became more acute, one could envisage a serious and growing split between the two portions of the Alliance.

One of the lessons we had learned during the long years of arms control discussions with the Soviets was the importance of NATO unity on the major issues. It was that unity which had enabled us to win out in the INF negotiations. It was that unity which had enabled us to make significant progress in START, on balancing conventional arms reductions, and on other issues. The United States had put an enormous effort into the most careful consultation with our allies to maintain that unity.

With the significant changes in the U.S.S.R. and in its apparent defense and arms control policies, many in NATO saw the threat from the East as being much less immediate and threatening than it had appeared to be in 1983 when the Soviets walked out on the INF negotiations. Thus the situation in January 1989 gave important political reasons to seek a solution to our differences with the Germans on the short-range missile issue.

Let me now turn to the military considerations. It was argued by a number of current and former NATO generals that flexible response is essential to NATO strategy and that that requires NATO to preserve an option, in the event of inability to stop an attack by the Warsaw Pact's conventional forces, to initiate a nuclear attack with short-range nuclear missiles and thus not leave an unfilled rung in the ladder of threatened escalation leading to the use of our strategic nuclear forces.

But why should exploitation of this particular rung be desirable or necessary? The Soviet Union has a great superiority in such weapons today, estimated by some to be at 6 or even 18 to 1, and without an agreement providing for highly one-sided reductions by the U.S.S.R. to U.S. levels or below, the U.S.S.R. will be able to maintain such superiority indefinitely into the future.

Any exchange between us at the level of short-range missiles would therefore be one-sidedly destructive for us and our allies, primarily the Germans.

If the objective is to demonstrate our ability to initiate a nuclear attack regardless of its effectiveness, we have in the European area a variety of nuclear weapons of every significant range.

An implied threat by us to expand a non-nuclear conflict in which NATO has run into difficulties, merely by adding a bilateral nuclear conflict with weapons almost all of which cannot reach Soviet territory and in which the Soviet side has an overwhelming advantage in numbers, range, and opportunities for modernization,

is unpersuasive on its face and can have little or no additional deterrent value.

The true deterrent to a Soviet attack in Europe upon us and our allies must be the great power and diversity of our strategic nuclear forces deployed at sea or based in the United States.

Taking both these political and military considerations into account, it appeared to me that the United States should consider taking the initiative and proposing to Chancellor Kohl that we ask the Soviets to join us in prompt negotiations for equal and non-zero ceilings on short-range missiles.

My suggestion in January of this year to Secretary Baker was that such an offer be contingent on the German Government agreeing to adhere to its previous position opposing the total elimination of short-range nuclear missiles and agreeing to support us in attempting to secure equal ceilings on such missiles at a level around 200 or 300 such missiles on each side. Concurrence of the other members of NATO would also be required.

At the Brussels NATO Summit the President and Secretary Baker worked out a temporary compromise with the Germans, on approximately these lines, but still, for reasons that I do not understand, resisting the idea of eventual negotiations with the Soviets aimed at equal non-zero ceilings on short-range missiles.

Let me now turn to longer run prospects of NATO, our role in NATO, and conventional force reductions. In the past 40 years NATO has always appeared to be more or less in disarray. But even when under the most intense pressures, as when General De Gaulle withdrew France from the NATO military organization, but not from the treaty, the NATO members have hung together.

The manifest and continuing threat from the East and the essentiality of the U.S. contribution to both the conventional and the nuclear NATO deterrence to that threat were evident and tended to overcome the centrifugal forces in the Alliance in every crisis situation.

But will this continue to be true in the future? The view that the threat from the East has diminished to the unimportant is already widespread. Only a few credit that shift to the continuing strength and unity of NATO when that was needed.

Other interests, such as exploiting the new economic unity of the Economic Community after 1992, are high in the minds of many of NATO's European members. Germany feels itself strong and entitled to an expanding role in world affairs. Some are tempted by, what I believe are unrealistic, dreams of German reunification.

A more realistic approach may be found in a pan-European framework that separates Central European political and national entities. Such historical arrangements as the Holy Roman Empire and the German Confederation permitted states of diverse and even opposite political and social systems to be linked under a broad umbrella while remaining separate. Such an arrangement might provide the essence of a new European solution.

Gorbachev originally tried to exclude the United States from his "common European house" proposal, but the Germans and other Europeans insisted on an American role and Gorbachev agreed.

As Richard Smyser suggests, United States policy needs to adjust as Europe redefines its identity. We should not retreat from

Europe. We and our partners should consider how to preserve the essential strategic, political, and economic relationships between Western Europe and the United States under new circumstances.

Under those circumstances what should be the pertinent guidelines of U.S. policy? They should call both for caution and imagination. We do not need to let down our guard while we explore promising possibilities.

In our relations with our allies, we should not be overdemanding or hectoring. Our economic strength, though important, is not unique as it once was. Our budgetary problems are such that our defense expenditure are bound to be restrained.

Our allies must want our cooperation and quiet leadership if it is to be effective. It would be useless to attempt to force unwanted policies on them.

It is my view that President Gorbachev needs significant conventional arms reductions in order to give perestroika a chance. The President's proposal at the NATO Summit opened up the possibility of that coming about and was warmly supported by our allies. The NATO Summit as a result was a significant political success for the President.

My principal reservations about optimism concerning the full range of arms control negotiations with the Soviets is that nuclear reductions going beyond those agreed in the joint draft text of the START agreement on the table in Geneva are unlikely to save the Soviet Union much in the way of resources translatable into support for perestroika.

I would therefore not be surprised to see the Soviets take a less cooperative line on the START negotiations than on the balancing conventional reductions area. Until the START issue is closer to resolution, I would resist unilateral cuts in U.S. nuclear capabilities.

Thank you, Mr. Chairman.

Senator EXON. Thank you very much, Mr. Ambassador. Before we go to questions, we will hear from Dr. Van Cleave. We welcome you.

STATEMENT OF WILLIAM R. VAN CLEAVE, SENIOR RESEARCH FELLOW, HOOVER INSTITUTION, AND DIRECTOR, CENTER FOR DEFENSE AND STRATEGIC STUDIES, SOUTHWEST MISSOURI STATE UNIVERSITY

Dr. VAN CLEAVE. Thank you, Mr. Chairman. I thank the committee for inviting me here. It is always an honor to appear with Ambassador Nitze, with whom I have had the honor of working 20 years; and it is always a pleasure to appear with him, whether we are on the same side or different sides of the question.

It is, however, a little bit intimidating, in view of my lengthy 32-page statement, to encounter one who can produce a statement that meets exactly the 15 minutes requested.

I have submitted my written statement in four parts and will merely summarize it.

Senator EXON. Without objection, we are pleased to accept your full statement for the record.

Dr. VAN CLEAVE. Thank you, sir.

In addressing the current issues on arms control and short-range force modernization, it does not seem inappropriate to me to recall part of the debate over the INF Treaty. Some of us, including my own testimony before the full Senate Armed Services Committee, warned that the INF Treaty would transform German politics and that we would not be happy with the transformation.

We warned that it would strengthen the forces opposing modernization of the remaining U.S. tactical nuclear forces and even encourage their elimination. European politicians who had fought very difficult political battles on behalf of the INF forces, only to see the United States agree to their removal, would be disinclined to repeat the same experience in order to deploy or modernize short-range systems which, after all, would be used on their own territory.

Others, including as I recall Mr. Nitze, argued that failure to ratify the INF Treaty would be most likely to produce those admittedly unhappy results. They argued that we must be sensitive to the political situation in Germany, that rejection of the treaty would be so counterproductive that the Kohl government would either fall or would be forced in self-defense to adopt FDP, SDP, or even Green arms policies, and that would be an end to nuclear modernization, at least for the Federal Republic.

Ratification of the treaty, they argued, on the other hand would help shore up beleaguered allied governments, demonstrate American sensitivity to their politics and American sincerity about arms control, and increase Alliance harmony and cohesiveness. It would consequently improve the prospects for modernization and strengthening of both the short-range nuclear forces and NATO's conventional forces.

Indeed, many at the time of the INF Treaty, not excluding leading Germans, emphasized such modernizations as essential conditions for the acceptability of the INF Treaty.

What strikes me as ironic is that these same latter political arguments are now being emphasized on behalf of immediate negotiations to reduce the short-range systems. Mr. Nitze and I agree that we should avoid the third zero and the elimination of short-range nuclear forces, although Mr. Nitze's statement today seems to imply that we could just as well go to zero since American strategic nuclear forces constitute the true extended deterrent, a point with which I do not agree.

But I believe we must be frank. In contrast, for example, to the Montebello decision, in which modernization and reduction of weapons were to go hand in hand, now reductions through negotiations would most likely replace modernization.

Rushing into such negotiations at this time would only impart new momentum in favor of the Soviets' longstanding effort to denuclearize Western Europe, just as it was entirely predictable that the decision to have two zero options would encourage the Soviets and the Germans to insist upon a third one eliminating short-range nuclear forces.

Let us not be too quick to permit what seems to be the present political situation and trends in Germany to rush us toward untimely disarmament or negotiations. We need not willingly turn a

prophecy into a self-fulfilling one by ascribing inevitability to it and acting accordingly on it.

I would argue that, just as with the INF Treaty, the political consequences the proponents of immediate negotiations warn about are the very consequences that we would promote by the negotiations and their likely outcome. And I would also suggest that the movement in Germany toward the third zero and against all modernization, while strong, is not so inexorable as many assert.

In Bonn less than 4 weeks ago I participated, along with former NATO Secretary General Joseph Luns, in a 4-hour lecture-seminar-discussion with some 150 leading Germans, including members and leaders of the Bundestag. While most were supportive of the German Government's position, most, virtually all I would say, at the same time opposed denuclearization of the Federal Republic and supported nuclear modernization at least in principle. Many specifically agreed to the necessity of a Follow-On To Lance and artillery modernization, although after the next German elections.

And perhaps we should also not forget that we have other allies in NATO who strongly support modernization and firmly oppose the third zero and doubt the wisdom of immediate negotiations.

There would probably be broad agreement on the proposition that NATO's modernization of its tactical nuclear forces has lagged that of the Warsaw Pact for many years; that this has produced a situation where the Pact has, as Mr. Nitze pointed out, an overwhelming advantage in these forces; and that this advantage should be reduced by some combination of modernization and arms control. I believe Mr. Nitze would agree with these propositions.

Mr. Nitze and I, however, seem to disagree on the relative priority and reliance we would place on modernization compared with arms control, as well as on the proper timing and the probable consequences of arms control negotiations on short-range nuclear systems. Mr. Nitze believes we are mistaken to defer negotiations on short-range systems. I believe it is correct to do so.

The proposal to proceed immediately to negotiate a reductions agreement on the short-range systems posits a bargain similar to that of the INF Treaty. The Soviets, with 1,500 launchers, and the United States, with only 88, agree to an equal ceiling at, say 50 launchers, or I believe Mr. Nitze has mentioned 100 or 200 missiles.

United States' hesitance to negotiate when put that way can be made to look irrational, if not downright perverse. But there are a couple of major problems. First is the assumption that we would be able to resist successfully the third zero in the process. Second is that such a deal by itself leaves and surely magnifies the conventional and strategic nuclear force imbalances and would weaken extended deterrence, weaken the Alliance, and heighten insecurity in Western Europe.

I believe the proper course of action is to insist first upon agreements and accompanying modernization programs that work to end the gross conventional and strategic force imbalances, and that particularly get rid of the principal Soviet offensive strike capabilities in both.

If the Soviets want American short-range forces in Germany and on the continent denuclearized so badly, then let them pay for it in

the equalization of the conventional and strategic balances. Otherwise, it seems to me there is too much risk.

Let me comment briefly on the NATO Summit. Commentators from both political parties and various political philosophies have celebrated the recent outcome of the NATO Summit meeting and in particular the arms control compromises, which appear both to reaffirm American political leadership and to lessen or at least postpone Alliance disunity.

The threat of a German move toward the third zero was averted, however temporarily. In return for relieving the Kohl government of the obligation to act immediately on modernization plans for the short-range systems the modernization plans were at least preserved.

Even more positively, according to this view, the Summit communique properly postponed negotiations on the short-range systems until after a satisfactory agreement reducing conventional forces to more equitable levels had been concluded and its implementation under way. And literally, the communique precluded "as far as can be foreseen" the elimination of short-range systems.

In making reductions of short-range systems contingent upon a reduction in Soviet conventional superiority, as well as reductions in Soviet short-range systems, it seems to me that a proper strategic relationship was established, and logically such a linkage should work against a third zero since there are no zeroes involved in conventional force negotiations.

This would seem to lay to rest, in principle at least, the major question of whether we should proceed with tactical nuclear force modernization or with negotiations on the third zero. It seems to set firmly aside the call to begin those negotiations without waiting for either conventional arms or a START agreement.

Those are the positive things that might be said about the recent Summit. From another perspective, however, and one more valid in my view, the celebration seems both short-sighted and premature.

The temporary "resolution" of NATO's internal difficulties has only increased the Alliance's dependence on arms control and inflated greatly the public's expectations for arms control. It encouraged western publics, particularly in the FRG, to anticipate and rely heavily upon arms control agreements to eliminate the military threat to NATO. In so doing, it may actually discourage the modernization of NATO's nuclear defenses, which it seemed to keep alive.

We know that when arms control dominates western security policy, we not only jeopardize essential military programs and modernization, we lose awareness of our security problems. Emphasis on arms control contributes to a perception that the threat to our security is inherent in the military forces themselves, including our own forces, rather than in the character, policies, and forces of the Soviet Union.

Whatever arms control initiatives Mr. Gorbachev proclaims today, we must understand that nothing has yet changed materially in the Soviet compulsion to arm and its established goal of military superiority or in its arms production programs.

Even with the qualifications and safeguards contained within the Summit agreement, the emphasis on arms control could well facili-

tate Soviet achievement of its strategic objectives, as outlined by many witnesses during the INF Treaty, which I will not go into at this time.

There are other problems as well. The President's call for a conventional arms agreement within 6 to 12 months encourages unrealistic expectations about the nearness of such an agreement and the ease with which it might be reached.

This can only pressure western negotiators and governments to complete a treaty riddled with loopholes, ambiguities, inequalities, and other flaws, not excluding those related to verification.

While the communique linked short-range nuclear systems negotiations to a conventional agreement, it did not do so to an agreement on strategic arms, START. Yet, the role and requirements for short-range tactical nuclear forces can no more be disassociated from the strategic nuclear force balance, and hence the outcome of START, than from the conventional balance, and hence the outcome of conventional arms negotiations.

As Ambassador Nitze wrote in an earlier article: "The balance at each significant level of potential violence or of deterrence affects and is affected by the balance at higher and lower levels."

Moreover, despite the communique's call for "equal and verifiable levels," practically speaking I believe there can be no such thing in any agreement governing short-range systems. It is not only that we could not verify limits on such small systems of easy concealability and mobility. It is also, and more, that such systems are almost inherently dual capable, and those retained ostensibly for conventional munitions purposes can be renuclearized in the field probably in a matter of a few hours.

In other words, having a nuclear capability in a delivery system of these types is more a matter of decision than of design of the system itself. The Soviets I believe would be bound to exploit this potential under any agreement governing short-range systems. Certainly we could not rely on their not doing so.

Therefore, no short-range systems agreement could possibly meet the tests that were set down in the NATO Summit comprehensive concept of arms control, that is that they must be verifiable and exclude opportunities for circumvention.

The next subsection of my statement addresses modernization and NATO strategy, and I will not take the time to go over this rather lengthy subsection except to say a couple of things.

The major point of this section is an obvious one, although we may have some discussion of it later. That is regarding the role and requirements for short-range tactical nuclear forces in the spectrum of deterrence and defense that constitutes flexible response: The general principles of their role have been agreed to and reaffirmed over and over again over a lengthy period of time.

The agreed general role of tactical nuclear weapons and the need for their continued modernization is longstanding and well recognized. My written statement summarizes the record of this.

The modernization issue strikes me as a truly critical one. The Alliance has collectively agreed virtually since its inception on the need to maintain defensive battlefield nuclear weapons, and it has agreed collectively for nearly two decades that those weapons must

be modernized to avoid obsolescence, to keep pace with the threat, and enable them to meet objectives agreed upon progressively.

According to the Nunn-Warner sense of Congress on the need for modernizing theater nuclear capabilities of September 28, 1988, Congress recognizes that requirement as well.

It should be pointed out that the Federal Republic of Germany, along with our other NATO allies, participated fully in the earlier decisions on the need to modernize NATO's nuclear forces, including the short-range systems. They participated fully in the planning to replace the early 1960's technology Lance with a new system before the old Lance becomes obsolete, and to modernize the nuclear artillery.

The important need for this modernization has been agreed among the members of NATO for well over a decade. Nuclear modernization objectives and requirements were established in the Alliance as a result of Nuclear Planning Group studies in the 1970's, and they have been reaffirmed at several subsequent NATO Summit or ministerial meetings.

Germany as a member of NATO seems to me to have an obligation to proceed with those plans, and I do not believe that expecting Germany to fulfill plans in which they have participated and to which they have agreed constitutes unwarranted pressure.

My written statement covers military requirements and the many technological opportunities for modernization. It also acknowledges, however, that the current political situation, as Mr. Nitze would point out, does greatly reduce the probability of very much modernization.

Political considerations have been paramount in the modernization issue for nearly 30 years, and we simply have to recognize that that is the case. Hence perhaps Mr. Nitze's emphasis on arms control over modernization.

We may have little choice but to seek modest improvements which, however, certainly do not or should not lack military value, but are constrained politically. Yet we need to demonstrate at least that NATO intends to modernize the remaining short-range nuclear forces and can do so, for failure to do so will mean not only the further bankruptcy of NATO's flexible response strategy, but also strong pressures to remove both nuclear weapons and United States forces from Western Europe. In this case, half a loaf would be better than none.

Moreover, I very much doubt that there is any chance, if there is any at all, of persuading the Soviets to equality through arms control if we do not demonstrate our ability to modernize and close the gap itself.

Even if Mr. Nitze's desired arms control agreement were to emerge, we would still need to modernize the systems and capability remaining if we are to keep these weapons and American forces in the field.

The increasingly popular West German argument that the short-range nuclear weapons can only be used on West German territory and therefore should go, must be effectively countered. This type of weapons system has existed in the Federal Republic since the 1950s and its purpose has been threefold.

As described by the former German Minister of Defense and current Secretary General of NATO, their role has been to deter conventional aggression and, if necessary, to blunt such aggression; to deter the Soviet use of tactical nuclear weapons and, if necessary, respond effectively to their use; and to express willingness to escalate to nuclear force in the defense of Europe.

We all hope the nuclear threshold is never crossed, Americans every bit as much as Germans. But questions remain that deserve careful consideration. Is the overriding objective deterrence or avoidance of the use of nuclear weapons? If it is the latter, what does that do to deterrence or, for that matter, defense?

Is it not possible that the more we reduce the effectiveness of our nuclear weapons or reduce the weapons themselves, the more we may encourage both conventional aggression and an aggressor's use of nuclear weapons because we have minimalized the risks to him for using them?

NATO's strategy has always been a blend of deterrence through direct defense, or denial, and the threat of escalation, with differences in emphasis on one or the other at any point of time.

The effectiveness of conventional force improvements, which this committee, the full committee, has strongly supported, can be substantially reduced unless NATO nuclear modernization makes the Soviet use of tactical nuclear weapons in Europe unattractive to the Soviets.

A conventional-only posture cannot do that. In fact, a risk noted in strategic writing all the way back to Kissinger's "Nuclear Weapons and Foreign Policy", Bernard Brodie's "What Price Conventional Capabilities in Europe," is that a strong NATO conventional defense, lacking suitable tactical nuclear weapons, could increase the incentives for initial or early Soviet use of nuclear weapons in the event of war.

At the other end of the spectrum, the consequence of failure to provide for adequate nuclear and conventional defenses in the theater is to place greater reliance on U.S. strategic nuclear forces for extended deterrence, on the strategic balance, that is, at a time when that balance, as Mr. Nitze has so eloquently pointed out on many occasions, is decidedly adverse to the United States.

I cannot imagine why those who worry justifiably about the strategic nuclear balance, the Soviet capability for counterforce attacks on United States strategic forces, or the possible consequences of a United States-Soviet strategic exchange would wish to rely more on strategic forces for extended deterrence than we do at this point in time.

These then in general seem to me to be the principles arguing for retention and modernization of the short-range nuclear forces. The basic requirements specifically for modernization in my view remain the same as they have for years. There are several aspects of this to be discussed. The final section of my written statement addresses both criteria for TNF modernization and specific recommendations for modernization. I will be happy to defer this discussion, however, to our question and answer period in the interest of time.

Thank you.

[The prepared statement of Dr. Van Cleave follows:]

NATO NUCLEAR DETERRENCE:
SHORT-RANGE NUCLEAR FORCE MODERNIZATION
AND THE NATO SUMMIT

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Introduction

In addressing the current debate over arms control and short-range nuclear force modernization, it does not seem inappropriate to recall part of the debate over the INF Treaty. Some of us -- for example, my own testimony before the Senate Armed Services Committee -- warned that the INF Treaty would transform German politics and that we would not be comfortable with the transformation. We warned that it would strengthen the forces opposing modernization of the remaining U.S. tactical nuclear forces, and even encourage their elimination. European politicians who had fought very difficult political battles on behalf of the intermediate range nuclear forces, only to see the United States agree to their removal, would be disinclined to repeat the same experience in order to deploy new short-range systems, which, after all, would be used on allied territory. If the elimination of the nuclear weapons that would only detonate on enemy territory were so beneficial, then it would be argued that the benefits would be greater from the elimination of weapons that would detonate only on host country territory, primarily that of West Germany.

Others, including Ambassador Nitze, argued that failure to ratify the INF Treaty would be most likely to produce those unhappy results. They argued that we must be sensitive to the

political situation in Germany, that rejection of the treaty would be so counterproductive that the Kohl Government would either fall or would be forced in self-defense to adopt FDP, SPD, or even Green armaments policies, and that would be an end to nuclear modernization, at least for the Federal Republic. Ratification of the treaty, they argued, would help shore up beleaguered allied governments, demonstrate American sensitivity to their politics and American sincerity about arms control, and increase alliance harmony and cohesiveness. It would consequently improve the prospects for modernization and strengthening of both the short-range nuclear forces and NATO's conventional forces. Indeed, many -- not excluding leading Germans -- emphasized such modernizations as essential conditions for the acceptability of the INF Treaty.

Today we see which of those points of view was the more correct. What strikes me as ironic is that these same latter political arguments are now being advanced on behalf of immediate negotiations to reduce the short-range systems. Mr. Nitze and I agree that we should oppose elimination of our short-range nuclear forces in Europe -- the "third zero" -- but we disagree on whether negotiations on those systems would help us maintain that position. I am concerned that, in contrast to the Montebello decision in which modernization and reduction of weapons were to go hand in hand, modernization in fact being a condition of reduction, now reductions would most likely replace modernization. And rushing into such negotiations at this time would only strengthen the pressures in Germany for the third zero. We would not be better off politically in Germany or more harmonious in the alliance if we now begin such negotiations.

Make no mistake, negotiations at this time ostensibly aimed at reducing the short-range systems on both sides to levels nearer equality would not be a palliative moderating pressures

for the third zero; they would contribute to those pressures. They would retard, not facilitate, necessary modernization; and they would separate these systems and the outcome of negotiations on them from the conventional and strategic force balances, which would be a serious strategic error.

An editorial in the June 2nd issue of the journal National Review was correct: "First, it is predictable that negotiations on short-range forces will impart powerful new momentum to the Soviets' long-standing effort to denuclearize Western Europe -- just as it was entirely predictable that the decision to have two 'Zero Options' ... would encourage the Soviets and others to insist upon a third one eliminating short-range nuclear forces."

Let us not be too quick to permit what seems to be the present political situation and trends in Germany to rush us toward untimely disarmament. We need not willingly turn a prophecy into a self-fulfilling one by ascribing inevitability to it and acting accordingly. I would argue that, just as with the INF Treaty, the political consequences that proponents of immediate negotiations warn about are the very consequences that we would promote by those negotiations and their likely outcome. And I would also suggest that the movement in Germany toward the third zero, and against all modernization, is not yet so inexorable as many assert.

In Bonn less than four weeks ago I participated in a four hour lecture-seminar-discussion with some 150 leading Germans, including leaders of the Bundestag. While most were supportive, or defensive, of the German Government's position, most -- virtually all, I would say -- at the same time opposed denuclearization of the Federal Republic and supported nuclear modernization at least in principle. Many specifically agreed to the necessity of Lance and artillery modernization after the next German federal elections.

Perhaps we should also not forget that we have other allies in NATO who strongly support modernization and firmly oppose the third zero. And then perhaps we should remind ourselves of broad agreements that have characterized NATO deliberations for some time.

There would probably be broad agreement on the propositions that NATO's modernization of its short-range, or tactical, nuclear forces has lagged that of the Warsaw Pact for many years; that this has produced a situation where the Pact has, by U.S. Government acknowledgment, "an overwhelming advantage" in these forces; and that this advantage should be reduced by some combination of modernization and arms control. I believe Mr. Nitze would agree with these propositions.

Mr. Nitze and I, however, seem to disagree on the relative priority and reliance we would place on modernization compared with arms control, as well as on the proper timing and the probable consequences of arms control negotiations on short-range nuclear systems. We perhaps also differ on the proper relationship of negotiations on conventional and on strategic forces, although I am not sure. We do differ in our confidence in Soviet sincerity about equal ceilings and in NATO's ability to stand firm during such negotiations.

In recent years, the advantages in both modernization and numerical strength of TNW have clearly passed to the Soviets. The Soviets have some 1,500 short-range nuclear missile launchers representing at least 3,000 missiles and warheads, and thousands of nuclear capable artillery, mostly self-propelled. While NATO has done very little to modernize its short-range delivery systems in the past twenty years, the Soviets continue to produce almost 500 short-range nuclear ballistic missiles annually, plus over 800 nuclear artillery/mortar systems, and hundreds more self-propelled field artillery and multiple rocket

launchers that could be nuclear capable. It is worth noting that these annual production figures have not changed much over the six years since 1983, despite all of Gorbachev's talk about military reductions. (In 1983, according to the Defense Intelligence Agency, the Soviets produced 810 nuclear artillery/mortar/ Frogs and 400 nuclear short-range ballistic missiles: in 1988, the respective numbers were 850 and 450.) As General Galvin testified, there has been a steeper curve of modernization of Soviet equipment in the last five years than in the five years before that. This does not seem to be the policy of a government genuinely interested in reducing and equalizing the short-range TNW balance.

The disparities in tactical nuclear modernization are clear, and they only add to the reasons for a more vigorous U.S. and NATO TNF modernization program. Mr. Nitze, I believe, agrees that we should not allow the Soviets to retain such immense advantage.

I believe that we should place both a higher priority and greater security reliance on modernization than on arms control. In that regard I believe -- and I do not know that Mr. Nitze would disagree -- that we must rely more on our own efforts to correct military problems than on the restraint and cooperation of the Soviet Union. After all, "high quality deterrence, not unilateral restraint to the point of eroding deterrence, is the surest way of avoiding a nuclear war."¹

Recent U.S. Policy has been to proceed steadily with modest modernization of short-range systems, to defer negotiations on such systems until the enormous Soviet advantages in conventional forces are reduced and equalized through arms control, and to count on short-range nuclear forces as essential components of extended deterrence in Europe for the foreseeable future. Prior to the recent NATO summit the United States made a

major concession to the Kohl government's political situation -- by agreeing to postpone the final decisions on Follow-On To Lance (FOTL) until after the German federal election at the end of 1990. Immediately, the Kohl government upped the ante and insisted on beginning negotiations to reduce short-range forces, with its foreign minister making it abundantly clear that these negotiations were expected to lead to the "third zero."

The proposal to proceed immediately to negotiate a reductions agreement on the short-range systems posits a "bargain" similar to that of the INF Treaty. The Soviets with 1,500 launchers and the U.S. with only 88 agree to an equal ceiling at, say, 50 launchers and a couple hundred missiles. Hesitance to negotiate when cast in terms of such a trade is made to look irrational if not perverse. Equal ceilings are obviously better than the current gross imbalance. But there are a couple of major problems. First is the assumption that we would be able to resist successfully the third zero in the process, and that modernization of the remaining forces would be facilitated. Second is the question of developments at the strategic and conventional force levels. An isolated agreement on the middle ground, particularly if it led to its denuclearization, would surely magnify the conventional and strategic nuclear forces imbalances, and would weaken extended deterrence. And, third, are the inescapable problems of verifiability and enforceability.

Having said that, let me agree with Mr. Nitze that if and when we enter negotiations toward reductions of the short-range nuclear systems in Europe, his carefully stated objectives are the proper ones: Reductions to equal ceilings confined to the surface-to-surface missile systems, and rejection of the third zero, leaving us free to modernize the artillery, the Lance, and

the air capability (with an extended range tactical air-to-surface missile). In fact, we should insist on assurances of allied support for such modernization as a condition of negotiated reductions. However, I doubt that such assurances would prove any more reliable than agreements that short-range nuclear systems and conventional forces should be modernized as conditions of the INF Treaty. The West generally acts as if hoped-for arms control ends constitute present realities, which relieve us of the burdens of modernization and allow us to pare its cost from our defense budgets -- even prior to any agreement.

I believe the proper course of action is to insist first upon the nuclear modernization NATO has agreed to in principle, and on agreements coupled with modernization programs that end the gross conventional and strategic force imbalances. If the Soviets want American forces in Germany, and on the continent, denuclearized so badly let them pay for it in equalization of the conventional and strategic balances.

The Federal Republic of Germany, along with our other NATO allies, participated fully in the earlier decisions to modernize NATO's nuclear forces, including the short-range systems. It participated fully in the planning to replace the early-1960s technology Lance with a new system before the old Lance becomes obsolete in the mid-1990s, and to modernize the nuclear artillery. The important need for modernization of NATO's theater nuclear forces has in fact explicitly been recognized and agreed among the members of NATO for well over a decade. Nuclear modernization objectives and requirements were established in the alliance as a result of NATO Nuclear Planning Group studies in the 1970s, and they have been reaffirmed at several subsequent NATO summit or ministerial meetings. Germany, as a member of NATO, has an obligation to proceed with

these plans.

I do not believe that expecting allies to fulfill plans in which they have participated and to which they have agreed constitutes "hectoring demands" or "unwarranted pressure."² Let me turn now to the recent summit.

The NATO Summit

Commentators from both political parties and various political philosophies have celebrated the recent outcome of the NATO summit meeting, and in particular the arms control initiatives and compromises, which appear both to reaffirm American political leadership and to lessen, or at least postpone, alliance disunity. From one perspective, this is warranted. The threat of a German move toward denuclearization -- the "third zero" -- which could only have been encouraged by immediate negotiations on short-range systems, was averted however temporarily. In return for relieving the Kohl Government of the obligation to act immediately on modernization plans for the short-range systems, including the follow-on to Lance (FOTL), the modernization plans were at least preserved.

Even more positively, according to this view, the summit communique properly postponed negotiations on the short-range nuclear systems until after a satisfactory agreement reducing conventional forces to more equitable levels has been concluded and its implementation underway; and, literally, it precluded "as far as can be foreseen" the elimination of short-range systems. Limiting such future negotiations to missile systems, thereby apparently omitting the nuclear artillery from any negotiated reductions, the communique specified a "partial reduction of American and Soviet land-based nuclear missile forces of shorter range to equal and verifiable levels." Elsewhere it reiterated the commitment to "equal ceilings at

lower levels," and also to modernization of the reduced but retained nuclear forces.

In making reductions of short-range systems contingent upon a reduction in Soviet conventional superiority, as well as reductions in Soviet short-range nuclear systems a proper strategic relationship was established; and, logically such a linkage should work against the third zero since there are no zeros involved in CFE negotiations.

This would seem to lay to rest, in principle at least, the major question of whether we should proceed with tactical nuclear force (TNF) modernization or with the "third zero." It also seems to set firmly aside the call to begin negotiations on the short-range nuclear systems, without waiting for either a conventional arms or START agreement.

From another perspective, however, one more valid in my view, the celebration seems both short-sighted and premature.

The temporary "resolution" of NATO's internal difficulties only increased the alliance's dependence on arms control and inflated greatly the public's expectations for arms control. It encouraged Western publics, particularly in the Federal Republic of Germany (FRG), to anticipate and rely heavily upon arms control agreements to eliminate the military threat to NATO. In so doing, it may actually discourage the modernization of NATO's nuclear defenses, which it seemed to keep alive.

(Within two weeks of the President's conventional arms reduction proposal, the Congressional Budget Office reported that the savings from it could amount to \$2 billion a year. Some Congressmen will soon be treating that as money in the bank -- to be reduced from the defense budget, rather than put into modernization programs.³ The same will occur with proposals and negotiations to reduce short-range nuclear systems.)

When arms control dominates western security policy, we not

only jeopardize essential military programs, we lose awareness of our security problems. Emphasis on arms control contributes to a perception that the threat to our security is inherent in the weapons themselves, including our own weapons, rather than in the character, policies, and forces of the Soviet Union. We also lose sight of the fact that, historically, disarmament has worked only on those who have wished to be disarmed, but not on the side that wishes to arm. Whatever arms control initiatives Gorbachev proclaims today, we must understand that nothing has yet changed materially in the Soviet compulsion to arm and its established goal of military superiority. Rather, Soviet leaders most probably see arms control as a means to facilitate the maintenance and enhancement of strategic superiority.

When I testified on the INF Treaty before the Senate Armed Services Committee, I said that it seemed very likely to me that the Soviets' view of the Treaty was that it would undercut NATO strategy, increase tension in the alliance as a result, and very possibly lead to eventual denuclearization of U.S. forces in Europe.

The Soviets think and act strategically, and they seem to have, I said, an arms control strategy aimed at certain objectives:

- * the elimination of a NATO nuclear capability, which the Soviets regard as a major threat to their own strategy, and the concurrent elimination of prospects for NATO's modernizing and improving that capability;
- * the weakening of NATO's political cohesion;
- * the unraveling of NATO's strategy of flexible response;
- * increased pressures in Europe for "denuclearization," or at least against nuclear modernization -- which would result in increased pressures in the United States for force reductions or removal;

- * a new period of detente, or Ostpolitik, which would dull Western vigilance and competitiveness while providing the Soviets with the benefits of trade, technology transfer, and financial credits;
- * self-imposed constraints on U.S. and allied arms programs beyond nuclear modernization programs;
- * and, consequently, relief from the costs they would otherwise have to bear if they are to maintain military superiority over the West.

Even with the qualifications and safeguards contained within the summit agreement, the emphasis in it on arms control could well facilitate Soviet achievement of these objectives.

In fact, the decisions and compromises made at the NATO summit may seriously erode NATO's strategy and cohesion in the long run by further setting the stage for inaction on TNF modernization and continued German pressure toward the third

zero.⁴ Both Chancellor Kohl and Foreign Minister Genscher have made interpretive comments subsequent to the communique that underscored this concern; e.g., Minister Genscher's statement that prior to the summit "we had modernization without negotiations. Now we have negotiations without

modernization."⁵ Failure to carry through with long planned TNF modernization would lead at least to gradual elimination of the forces through obsolescence, and probably to quicker elimination by negotiation or demand.

There are other problems as well. The President's call for a conventional arms agreement with 6-12 months encourages unrealistic expectations about the nearness of such an agreement and the ease with which it might be reached. This can only pressure Western negotiators and governments to complete a

treaty riddled with loopholes, ambiguities, inequalities, and other flaws, not excluding those related to verification.

While the communique linked short-range nuclear systems negotiations to a conventional agreement, it did not do so to an agreement on strategic arms (START). Yet, the role and requirements for short-range tactical nuclear forces (TNF) can no more be dissociated from the strategic nuclear force balance, and hence the outcome of START, than from the conventional balance, and hence the outcome of conventional arms negotiations. "The balance at each significant level of potential violence -- or of deterrence -- affects and is affected by the balance at higher and lower levels."⁶

The short time frame set forth for a conventional arms agreement may not be congruent with the time frame to conclude a START agreement; and certainly would not be if the United States refrains from entering a Start agreement until it has made critical decisions about strategic force modernization and SDI.

Moreover, despite the communique's call for "equal and verifiable levels," practically speaking there can be no such things in any agreement governing these short-range systems. It is not only that we could not verify limits on such small systems of easy concealability and ready mobility. It is also, and more, that such systems are almost inherently dual-capable, and those retained ostensibly for conventional munitions purposes, can be "renuclearized" in the field probably in a matter of a few hours. Dr. Roland Herbst of the RAND Corporation, one of our leading experts on military technology, has concluded:

"The conversion of a delivery system from a conventional to a nuclear weapon, rapidly and in the field, is a possibility for most delivery systems of sufficient size. The technology is available to both the U.S. and the

Soviets. Any agreement which attempts to control this distinction is subject to rapid violation at any time...If there were, for instance, an agreement to eliminate all short range nuclear delivery systems in Europe, it is quite clear that with only modest efforts the Soviets could prepare most of their fire support systems to be convertible to nuclear systems."⁷

In other words, having a nuclear capability in a modern delivery system is more a matter of decision than design.

The Soviets would be bound to exploit this potential, under any agreement governing short-range systems; therefore, no short-range systems agreement could possibly meet the tests stipulated in the NATO summit "Comprehensive Concept of Arms Control;" i.e., that it must be verifiable and exclude opportunities for circumvention.

The dual-capability, dual-role potential inherent in many launch platforms and delivery systems has long been recognized in the United States; witness the debate over the ATACM as the Follow-on-to-Lance (FOTL) missile, and the plans to utilize the MLRS launch platform simultaneously for missiles with conventional and nuclear warheads. But there remains opposition in the United States to utilize dual-capability in many new systems. Part of the opposition is based on a concern that the nuclear component would reduce the conventional effectiveness of the system, or reduce our commitment to strengthening conventional forces. Part of it is based on the opposite military concern, that conventional operations practices would lower the availability and effectiveness of the nuclear components. And a large part of it is based upon arms control. To deny ourselves a capability and advantage that the Soviets will exploit in the name of some unverifiable and unenforceable arms agreement would be folly indeed.

Modernization and NATO Strategy

The modernization issue strikes me as a truly critical one. The alliance has collectively agreed virtually since its inception on the need to maintain defensive battlefield nuclear weapons, and it has agreed collectively for nearly two decades that those systems must be modernized to avoid obsolescence, to keep pace with the threat, and to enable them to meet objectives agreed upon progressively through the 1970s.

According to the Sense of Congress on Need for Modernization of Theater Nuclear Capabilities of NATO (Sec. 1004, National Defense Authorization Act for Fiscal Year 1989, Conference Report to Accompany H.R.4481, September 28, 1988), it is the sense of Congress that --

"modernization of the theater nuclear capabilities of the NATO is essential to the deterrence strategy of the NATO alliance, particularly in light of the requirements of the INF Treaty for the destruction of intermediate-range nuclear weapons."

This statement deserves emphasis. The remaining TNW capability and its modernization are critical to extended deterrence.

Mr. Nitze asks "why should exploitation of this particular rung be desirable or necessary?" The answer is: For the same reasons and roles that have always been attached to these weapons: To help deter a conventional attack when the conventional force balance, and offensive attack capabilities, favor the Soviets; to make it risky for the Soviets to mass conventional forces for attack, and to reduce the effectiveness of such an attack; to stop specific break-throughs that would breach or destroy key defenses; to help defend American forces; to slow an attack and buy time for wrenching decisions about

wider use of nuclear strikes; to shift the decision for nuclear escalation to the Soviets; to dissuade the Soviets from using tactical nuclear weapons by having a response in kind; and finally to provide an escalatory link to external forces. If the only reason were the last, then one could argue that numbers of weapons, their military effectiveness, and their continued modernization are not very important. But that is not the only reason for the TNW, and all the other reasons make numbers, effectiveness, weapons characteristics, and modernization very important matters.

The increasingly popular West German argument that the short range nuclear weapons can only be used on West German territory, and therefore must go, must be effectively countered. Such weapons have existed in the Federal Republic since the 1950s, for the purposes just cited. German officials have recognized these purposes. For example, the recent German Minister of Defense, and current Secretary General of NATO, described their role: to deter conventional aggression, and, if necessary, to blunt such aggression; to deter the use of tactical nuclear weapons and, if necessary, to respond effectively to their use; and to express willingness to escalate to nuclear force in the defense of Europe.

We all hope the nuclear threshold is never crossed -- Americans every bit as much as Germans. But questions remain that deserve careful consideration: Is the overriding objective deterrence or avoidance of the use of nuclear weapons? If it is the latter, what does that do to deterrence, or for that matter defense? Is it not possible that the more we reduce the effectiveness of our nuclear weapons, or the weapons themselves, the more we may encourage both conventional aggression and an aggressor's use of nuclear weapons (because the risks to him are minimized)?

NATO's strategy has always been a blend of deterrence through direct defense, or denial, and the threat of escalation, with differences in emphasis on one or the other at any point of time. While, to many, the role of the nuclear weapon uniquely fits the second category rather than the first, in fact the role of the nuclear weapon has from the beginning been for both deterrent functions.

Even when the use of TNW in the battle area was seen as not primarily for military effectiveness, but rather to threaten escalation, the alliance correctly decided that they should be employed against military targets for defensive military purposes. Consequently, questions of military effectiveness and considerations of collateral damage are important. And since these weapons themselves would be prime targets, they must be survivable. Hence the need for modernization.

During the 1970s, NATO conducted important studies of these TNW requirements, which led to modernization proposals and plans. Many of these studies were sparked by the 1974 report on NATO by Senator Nunn, which led to the Public Law 93-365 Congressional directive to study TNW in Europe. This resulted in the April 1975 report to Congress by Secretary of Defense Schlesinger, which focused on the need for both conventional and tactical nuclear improvement. That report, fourteen years ago, called for: "Structuring of NATO's theater forces to improve survivability, provide greater military effectiveness in combined conventional-nuclear conflict, improve command and control, reduce collateral damage and increase the security of nuclear weapons in peacetime."

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This report and contemporary NATO studies led to alliance decisions calling for fairly extensive theater nuclear force modernization, for both short and longer-range systems, with the

same objectives identified in the report.

The allies, therefore, explicitly recognized that the purpose of TNW is both deterrence and defense. As a recent report issued by the Pentagon's Commission on Integrated Long-Term Strategy put it: "The West Needs to be able to do two things: one is to be able to mount a strong defense in the region attacked, for this will have the greatest credibility as a deterrent, but it is also important to have visible options for wider responses."¹⁰

The basic rationale for modernized short-range, defensive TNW, specifically for use on allied territory, was set forth clearly by President Jimmy Carter in an 11 July 1977 letter to Senator Stennis on enhanced radiation (ER) warheads. "Tactical nuclear weapons, including those for battlefield use, have strongly contributed to deterrence of conflict in Europe," President Carter wrote, "It must be recognized that NATO is a defensive alliance which might have to fight on its own territory. An aggressor should be faced with uncertainty as to whether NATO would use nuclear weapons against its forward echelons. For these purposes, the capability for discreet application of force -- which the ER weapons may provide -- presents (at least in this sense) an attractive option...The ER weapons, then, would be designed to enhance deterrence, but if deterrence fails to satisfy dual criteria: -- First, to enhance NATO's capability to inflict significant military damage on the aggressor. -- Second, to minimize damage and casualties to individuals not in the immediate target area, including friendly troops and civilians."

Whatever the reality of the alleged new Soviet conventional emphasis/nuclear avoidance doctrine, the Soviet nuclear threat in the theater remains, and the effectiveness of conventional force improvements will be substantially reduced unless NATO

nuclear modernization makes the use of TNW in Europe unattractive to the Soviets. A conventional-only posture cannot do that. In fact, a risk noted in strategic writing all the way back to Henry Kissinger's Nuclear Weapons and Foreign Policy and Bernard Brodie's "What Price Conventional Capabilities in Europe?" is that a strong NATO conventional defense, lacking suitable TNW, could increase the incentives for initial or early Soviet use of nuclear weapons in the event of war.

Consequently, it is imperative that TNW modernization
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 accompany conventional force modernization.

At the other end of the spectrum, the consequence of failure to provide for adequate nuclear and conventional defenses in the theater is to place greater reliance on U.S. strategic nuclear forces for extended deterrence, on the strategic balance that is, at a time when that balance is decidedly adverse to the United States.

Former Secretary of Defense James R. Schlesinger made what I believe to be an inescapable point in his testimony on the INF Treaty. He pointed out that the INF agreement, removing U.S. INF from Europe, "expands the role in overall nuclear deterrence that must be played by U.S. strategic forces. The role of these forces in providing extended deterrence is therefore an increasingly preponderant one." Failure to modernize and maintain the short-range defensive TNW would make this reliance virtually complete.

I cannot imagine why those who worry (justifiably) about the strategic nuclear balance, the Soviet capability for disarming attacks on U.S. strategic forces, or the possible consequences of a U.S.-Soviet strategic exchange should wish to rely more on strategic forces for extended deterrence. And I doubt that the American people would support it.

Without at all suggesting "decoupling," it seems clear to

me that deterrence should rest more on the ability to defend and to deny the objective of an attack than on the threat of essentially uncontrollable escalation.

As the Pentagon's 1988 report, The Future of Containment put it: "The massive growth in Soviet nuclear forces means that the U.S. commitment to defend Europe with nuclear weapons might not retain even residual credibility if it rests primarily on the threat of uncontrolled escalation. . . . For the foreseeable future, however, nuclear systems should be configured so that, if they are needed, they will be available and effective in carrying out NATO military doctrine by helping to stop an invasion by Soviet general purpose forces," and to shift the burden of further nuclear escalation to the Soviets."¹² In doing so, they must have the "capacity to act effectively against targets of early military and political significance while limiting collateral damage to civilians." (p. 88) It is this defensive capability that would force Soviet forces to adopt a "nuclear scared," dispersed, and less effective posture in a non-nuclear offensive, thereby contributing to NATO's non-nuclear defense and strengthening deterrence.

But, as the Pentagon report also correctly emphasized, there is the threat of a combined Soviet nuclear/non-nuclear attack ("predominantly non-nuclear" combined with "relatively few nuclear weapons" used against the small numbers of targets critical to NATO's defense posture), that could be extremely effective while keeping collateral damage at low levels. (p. 89)

"If NATO cannot fight such a combined non-nuclear and selective nuclear war, it must rely more heavily on threats to escalate to larger scale use of external nuclear weapons, which is no longer a prudent strategy. A deficiency of this sort strains the credibility of NATO's threatened response and

increases the expected level of damage on both sides of the Atlantic if it has to carry out the threats." (p. 90)

These, then, are the general reasons for modernization. What specific programs of modernization should now be supported

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and carried through?

Specific TNW Modernization Recommendations

From both a technological and a military standpoint, there are many requirements and opportunities for modernizing and improving NATO's tactical nuclear forces (TNF). This is so because of advances in technology, and because NATO TNF modernization has been relatively stagnant over the years. (In the past decade it was focused on and largely limited to the INF systems now being dismantled.) Consequently, the same modernization requirements generally agreed upon by the NATO Nuclear Planning Group in the mid-1970s remain today:

- Greater force survivability
- Higher reliability and responsiveness
- Enhanced effectiveness against both front line, first echelon forces, and deeper targets, both fixed and mobile
- Reduced collateral damage
- Better safety

In addition to improvements in survivability, targeting capability, and discriminatory effects, I would note in passing, but not try at this time to elaborate, certain important requirements in the area of non-force-acquisition modernization: a posture less dependent on a few fixed, highly lucrative, and vulnerable targets; streamlined nuclear release procedures, especially for clearly defensive weapons; and more serious training of the military for the nuclear battlefield, including the development of a doctrine for combined selective nuclear and non-nuclear combat.

Now there is also a requirement, and new opportunity for theater ballistic missile and improved air defense, which as I said becomes even more important with the elimination of NATO's INF forces.

The history of TNW modernization has been one of considerable self-denial of improvements technologically available. There are many reasons for this, including vacillation over the question of how much military defensive capability TNW should have to strengthen the political requirement of deterrence. The political issues have clearly been paramount over military requirements and technical options, and this will undoubtedly continue to be the case. Now even more so than before.

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The current political situation, I agree has to produce pessimism that appreciable modernization toward the objectives listed above will be achieved. Hence, perhaps, Mr. Nitze's resort to arms control. As much as I would argue for more thorough-going modernization, in line with established objectives, we may be forced politically to seek more modest improvements, such as those now being supported by the U.S. military (and I do believe these to be modest). These improvements certainly do not lack military value, but they are constrained politically. Yet we need to demonstrate, at least, that NATO intends to modernize the remaining short-range TNF, and can do so. For failure to do so will mean not only the further bankruptcy of NATO's flexible response strategy, but also strong pressures to remove both nuclear weapons and U.S. forces from Western Europe. In this case, half a loaf is better than none.

Moreover, I very much doubt that there is any chance of persuading the Soviets to equality through arms control if we do not demonstrate our ability to modernize and close the gap

ourselves. And even if Mr. Nitze's desired arms control agreement were to emerge, we would still need to modernize the systems and capability remaining if we are to keep TNW and American forces in the field.

In the interest of time, I will forego a complete summary of TNW modernization requirements and opportunities, and confine my remarks to the more immediate issues concerning you: delivery system and warhead modernization pertaining to a few systems.

For these systems, the objectives I would emphasize most are enhanced survivability against attack for the launch platforms and delivery systems, and lower collateral damage, including minimal residual radiation, in the event of defensive use for the warheads (which of course also implies improved accuracy for the delivery systems.)

A short commentary on the latter. The technological potential available for clean and tailored effects warheads -- capable of being very discriminate in targeting and of reducing both the reality and the image of necessary high levels of civilian destructiveness -- has never been reflected in deployed weapons. True, the average yield of the TNW stockpile has been reduced several fold since the 1960s, and this is certainly a noteworthy improvement. But despite the attractiveness of lower collateral damage, we have never emphasized warhead technology to achieve it. To date the most significant development in TNW warhead technology, that now over a quarter century old -- enhanced radiation -- has yet to be deployed in the field. I think that is a shame. I recognize the political dimension and will not dwell on this topic, but I would certainly keep the ER development and deployment plan alive.

Now to the specific issues at hand.

With the INF Treaty, it appears that we have foregone the

ability to strike important targets well beyond the forward edge of battle and NATO territory, except by aircraft. But maybe not, and at least two current programs that could help meet this problem deserve your support: an air-to-surface (ASM) extended range missile for theater tactical aircraft, the range of which would not be limited by the INF Treaty, and the FOTL, a missile with potentially maximum range allowable under the INF Treaty. In his testimony on the INF Treaty, General Galvin cited these as his highest modernization priorities given the INF Treaty. The extended range tactical ASM was his first priority, but he also emphasized the complementary requirement for a ground-launched missile with maximum range due to the vulnerability of airfields and the penetration problems of aircraft.

The existing Lance is based on technology at least a quarter of a century old; it has serious limitations in survivability, responsiveness, range, and discriminate targeting capability. Extending its service life is not a satisfactory, or even practical, option.

Preliminary decisions have recently been made to develop a follow-on missile (but not the ATACM) for compatibility with the MLRS launcher. Such a properly designed dual-capable system should increase the survivability of the nuclear FOTL by forcing an attacker to consider all of the systems deployed as potentially nuclear; and greater concealability, dispersibility, and mobility would enable us to place a 495 km system nearer the border for better target coverage. This program should be supported, and we should insist on the earliest possible allied commitment to its development.

I would go farther, however. I would develop the FOTL missile so that it can be carried by and launched from standard military trucks, and would also deploy it in that fashion so that the weapon is not distinguishable from the thousands of

trucks in the field. If such dispersal of nuclear systems is considered too great a risk or political problem, I would recommend exploration of insertible nuclear capsules (INC) as a solution. Such small, light weight capsules could be delivered readily to systems in the field by VSTOL aircraft, helicopters, or even jeeps.

I would also recommend developing an advanced ER warhead option for the FOTL, assuming we resolve satisfactorily the problems that now exist with the production of the necessary nuclear material. It is even possible that ER and INC could be developed compatibly.

Even with the tactical ASM and the FOTL, one of the logical implications of the INF Treaty (especially since it applies to non-nuclear, as well as nuclear, systems) is that a somewhat lower priority must be given to attacking deep targets. This seems to me to argue for a new re-emphasis on forward defense capabilities against first echelon forces (and active defenses against missile and air attack). This requires that we reverse a tendency of recent years and reestablish a strong case for short-range battlefield systems, including artillery as well as missiles.

We should consider, and emphasize, that battlefield TNW are inherently the most survivable of land-based sub-strategic nuclear forces because they are (or should be) the most difficult to target and because their numbers, dispersibility, and limited capabilities make them, individually, less lucrative and compelling targets than intermediate range forces, which are bound to be fewer in number, less dispersed, and individually more threatening. In sufficient numbers, an attack could never count on their all having been destroyed so must proceed under constant threat of their use. The battlefield TNW are also the most responsive nuclear systems, the most suitable for rapidly

changing targets of opportunity. They would be used only against clearly aggressive forces, and for defensive purposes principally on NATO territory, so are not as "escalatory" as longer range systems. Of course, we should also streamline release procedures for these weapons; and, again, insertible nuclear capsules might ease the problems of keeping them dispersed in the field in peacetime.

This commentary applies particularly to the artillery-fired atomic projectiles (AFAP), and General Gavin's third modernization priority was the artillery.

In this regard, the FY 1989 Authorization Act that limited modernized AFAPs to a total of 925 (8-inch/155mm), no ER, and \$1.1 billion spending cap should be reversed in all three aspects. We require more modern AFAPs than 925, or we will be faced with retaining older, less effective, less discriminate AFAPs indefinitely. While it can be argued that a vigorous AFAP modernization program would encounter in Europe the same resistance as the FOTL, it should also be pointed out that AFAP modernization is a long-standing NATO requirement and retention of less effective and less discriminate AFAP, with much graver collateral damage potential, could also be politically vulnerable.

AFAP modernization should proceed in phases. An 8"/155mm mix should be retained. The W-33 (8") warheads, first deployed in 1956, and W-48 (155mm) warheads, first deployed in 1963 should be replaced as soon as feasible. Present plans are to replace them with the W-79 (8") and W-82 (155mm) which offer advantages in range, effectiveness, and survivability.

However, even these are not optimal and we should proceed with an R&D program aimed at improved ER rounds, including especially for the 155mm, minimized residual radiation, and perhaps other tailored effects.

One additional word on the INCs and I will close these brief modernization recommendations. I have commented on the obvious: That in our present TNW deployment and strategic posture NATO is highly vulnerable to surprise attack by a relatively few, selective, and low collateral damage strikes. It is important to change such peacetime deployment. We should seek ways to allow TNW systems - the delivery systems at least - to be fielded in a dispersed and concealed manner. However, both the political and the peacetime security risks of this are clear. INC could play a role in helping resolve that

15 problem. With INC, the nuclear and non-nuclear components could be separated geographically, with the nuclear stored in small, dispersed, hardened or hidden sites in U.S. custody. The delivery systems could be operated by American or German (or any European) units. And the two could be mated rapidly with few logistical problems.

I thank the Subcommittee for inviting and listening to these views.

NOTES

1. Paul H. Nitze, "Assuring Strategic Stability in an Era of Detente." Foreign Affairs. January 1976.
2. Paul H. Nitze, "What Bush Should Do To Solve the NATO Flap." Washington Post, 14 May 1989, p. 23.
3. "Bush Troop-Cut Plan Might Save \$2 Billion." Associated Press, San Francisco Chronicle, 10 June 1989.
4. See "The NATO Summit: Will Bush's 'Double Hit' Become a Soviet Triple Play?" The Center for Security Policy, 31 May 1989. (Available from the Center, 202-466-0515.)
5. Time, 12 June 1989, p. 31.
6. Paul H. Nitze, "The Relationship of Strategic and Theater Nuclear Forces," International Security, Fall 1977.
7. Three unpublished drafts: "Tactical Nuclear Forces - Any Future?", April 1989; "NATO SRM Modernization," May 1989; and "Conventional Arms Control and Battlefield Nuclear Weapons," June 1989.

8. Manfred Worner, "NATO Defenses and Tactical Nuclear Weapons," Strategic Review, Fall 1977.

9. James R. Schlesinger, The Theater Nuclear Force Posture in Europe. A Report to Congress in Compliance with Public Law 93-365, 1975.

10. The Future of Containment. The Pentagon, October 1988, p. 19.

11. Elsewhere I have taken this an obvious step farther and argued that U.S. strategic nuclear force modernization, including the deployment of strategic defenses, must accompany those theater force modernizations. In fact, I believe U.S. strategic force modernization should have the highest priority, partly because a bad strategic force imbalance would magnify theater imbalances, as Helmut Schmidt observed a decade ago.

12. The Future of Containment, p. 85.

13. For a fuller treatment of this question see two books by S. T. Cohen and myself: Tactical Nuclear Weapons: An Examination of the Issues, Crane Russak & Co., 1978 and Nuclear Weapons, Policies, and the Test Ban Issue, Praeger, 1987.

14. And the traditional lack of enthusiasm in the U.S. military for TNF modernization.

15. They could also, in extremis, provide an option to total denuclearization of American forces in West Germany, by allowing delivery systems with the non-nuclear component of the warhead to be stationed in Germany and the nuclear component, as an INC, stored in the U.S. for rapid conversion in time of need. The papers cited above by Roland Herbst discuss this option. I do not wish to dwell on this option because I fear that once the nuclear is removed it will not be returned, and particularly not in time of need.

Senator EXON. Thank you, Dr. Van Cleave. And thank you, Dr. Nitze.

Let me ask the clerk to use the usual procedure so we can move right along.

NATO STRONGER

First let me ask both of you this question. I was rather astonished to hear the President say after the recent NATO discussion that NATO was stronger today than it ever was before. Do both of you agree?

Dr. VAN CLEAVE. I did not see the statement. I would not know in what context or in what terms he was putting that. We are probably stronger economically. I cannot see that we are stronger in terms of political cohesiveness, and certainly in terms of the military balance. At whatever level you choose to select, we are not stronger than we have been in the past, relative to the U.S.S.R. and Warsaw Pact.

Senator EXON. It is true, is it not, Dr. Van Cleave, that NATO is a military alliance rather than an economic one?

Dr. VAN CLEAVE. It is a security alliance, certainly.

Ambassador NITZE. May I comment?

Senator EXON. Yes, I want you to, Mr. Ambassador.

Ambassador NITZE. I think that NATO is stronger in absolute terms. If you just look at NATO's strength, I think it has never been as strong and has as good military capabilities as it has today.

But one really ought to look at the net balance, how does it stand vis-a-vis what would happen in a war with the Soviet Union or a war with the Warsaw Pact? I believe that in relationship with the Warsaw Pact it is not stronger. I think it still is in a position of very great inferiority in the conventional field and also in the tactical nuclear field.

NATIONAL SECURITY AND SECURITY OF NATO

Senator EXON. Talking about national security and the security of NATO, what is the opinion of both of you on the recent unilateral action on our part of removing our chemical deterrence from Germany, which means that we as NATO, have no deterrence whatsoever in Europe when we complete the pullout of those weapons?

Ambassador NITZE. I would have preferred a situation in which we had first modernized our chemical weapon inventory—I forget the Bigeyes, the name of the weapons system. But it would seem to me that the weapons we have had there were probably ineffective weapons and were politically totally objectionable to the continental members of NATO. So I do not think we had much choice but to do this.

Dr. VAN CLEAVE. I think there are three problems with doing that. One is of course removing from the theater the capability, however inadequate, to threaten to respond in kind.

Two, is that the removal of those weapons will inevitably reduce defensive capabilities and training for dealing with chemical weapons in the battlefield. It is inevitable.

Third, Mr. Nitze and I were in the Office of the Secretary of Defense in 1969 when this question first arose, in NSSM-69, a report in which I had a regrettably principal role. At that time the arms control argument was that we did not need to modernize our lethal chemical forces, or even, for that matter, retain them in the deterrent, because our nuclear superiority would compensate and would undoubtedly deter anybody's use of chemical weapons.

Now, clearly that nuclear superiority threat has vanished.

Senator EXON. It seems to me, just as an offhand comment, that the Europeans have been mesmerized by Mr. Gorbachev, the godfather of peace.

I wanted to ask you this question, Ambassador Nitze. Mr. Lothar Rühl, who is one of the leading defense experts in the Christian Democratic Party in West Germany, has said recently that he "could not foresee any situation in which we can agree to modernize Lance."

Do you agree that that is a significant problem, and what do you see as the end result of such a situation, if it exists?

Ambassador NITZE. I believe what Mr. Lothar Rühl was referring to was the political situation as it exists in Germany today. But my view is that we would have a better chance of approval of modern-

ization if it were the result of an agreement we had worked out with the Soviet Union for equal ceilings at a level of say 200 or 300 missiles on each side.

Under those circumstances, I think you could have a much better chance of arguing that that reduced force should be modernized. Now, whether you would actually get sufficient transformation in German public opinion to get modernization, I do not know.

But I think you would have a better chance of getting that done than if we were faced with a very large superiority, a continuing, growing superiority, in the short-range missile field on the side of the Soviets, because there is very little point of modernizing these if you are in any case being vastly outnumbered, outqualified, and so on and so forth in the field, while if you were operating under an equal ceiling of no more than say 300 missiles on each side I think it would be easier to justify modernizing those 300 than having to face an infinite threat.

I am not sure whether you could or could not get the Russians to agree to coming down to 200 or 300 on each side. It depends upon how much Mr. Gorbachev is going to be himself restrained by his own policy statements in the past.

He has said that the way to handle the conventional reductions was first of all to get rid of the inequalities by eliminating the superiority in any field where one side or the other has a superiority; and second, bringing it down to lower levels.

Now, in this particular field, in the short-range missiles, I do not think anybody could deny that today the Soviets have a very great superiority, someplace between a 10- or 18-fold superiority. Now, according to his own doctrine he ought to be willing to come down to equality.

And if this equality, let us say, is 300 on each side, he has got to come way down in comparison to what he has now.

All I am saying is I do not exclude the possibility that he could agree to this, because it is totally consistent with the policy statements he has made in the past. So I do not think he would necessarily insist upon not being in favor of any option here except a third zero.

And he knows perfectly well that the third zero is politically unacceptable to NATO as a whole and to many people even in Germany. There are those who argue for it, but even Kohl would not argue for it. Most of the parties would not argue for it.

Senator EXON. Thank you, Mr. Ambassador.

My time is up. Senator Wallop.

Senator WALLOP. Thank you, Mr. Chairman.

FRUITLESS TO MODERNIZE

Ambassador Nitze, both in your written statement and in response to the previous question you have made the argument that it is fruitless to modernize or do anything where the Soviet Union has a great superiority.

Ambassador NITZE. I did not mean to suggest that, no.

Senator WALLOP. Well, the statement says:

The Soviet Union has a great superiority in such weapons today, estimated by some at 18 to 1, and without agreement for highly one-sided reductions by the U.S.S.R. to U.S. levels or below, will be able to maintain such a superiority indefi-

nitely into the future. Any exchange between us at the level of short-range missiles would therefore be one-sidedly destructive for us and our allies, primarily the Germans.

And you go on arguing that we should therefore not—

Ambassador NITZE. No, I was arguing that it would be difficult to persuade the Germans that—it would be more difficult today to persuade the Germans under the current situation and projected situation to modernize than it would be if one could get the forces on the two sides down to equal levels. That is the argument I was making.

Senator WALLOP. It has always been difficult to persuade the Germans. Are we to view them as the only requirement for persuasion within NATO? Because the language coming after the Summit clearly indicated a French anxiety, as well as a British anxiety, about that. It is not just continental Europeans lumped into one versus the Anglos, as you called it.

Ambassador NITZE. The difficulty as I see it is you are not going to put nuclear weapons on German territory unless you have got the consent of the German Government. It is just a fact, you are not going to do that.

Senator WALLOP. There is the argument that some of us made that you cannot throw a rock into a still pond in INF, that this was an inevitable consequence of that.

Ambassador NITZE. No.

Senator WALLOP. You do not think it was an inevitable consequence?

Ambassador NITZE. I do not think it is an inevitable consequence, no. I do not believe in inevitability, frankly. I think it is, what are the political realities, what can you get done, what are the considerations of the various factors involved?

Senator WALLOP. Well, you choose to characterize it as a political reality. Was not that political reality totally predictable and predicted, that we would have this very problem with the Germans, despite the Montebello agreement, despite their public statements on modernization, that they would not and could not politically do this?

Ambassador NITZE. That it would be very difficult for them to do it and you would have to use great care politically in order to make it possible for the modernization of what was left after you have done your best to handle it.

CAUTION AND MODERNIZATION

Senator WALLOP. On the eighth page of your statement, you call for both caution and modernization—"we do not need to let down our guard while we explore promising possibilities." Is not failure to modernize and commit to the deployment letting down that guard?

Ambassador NITZE. We are not letting—we have to deal with reality in Europe. We are not letting down any guard. The question, the issue as far as we are concerned, is whether we are prepared to modernize.

As I understand it, we are not prepared to authorize the modernization unless there is a real prospect that the Germans will agree to the deployment of these in Germany. That is our problem.

PERSHING II MISSILE

Senator WALLOP. But there was no real prospect at a certain moment in time that the Germans would ever agree to the deployment of the Pershing II missile.

Ambassador NITZE. That is exactly why I do not think we ought to abandon that as a hope, but we have got to set it up so that there is some real—that we maximize the prospect that the Germans will agree to modernization.

Senator WALLOP. Dr. Van Cleave, there is a recent Washington Post article by Bob McCartney in which he stated that:

Bonn officials cautioned after the Summit that West Germany's reluctance to deploy new short-range nuclear weapons extends to nuclear artillery and tactical air to surface missiles as well. West Germany sought unsuccessfully to persuade the Summit to launch East-West negotiations on reducing nuclear artillery, and Bonn officials fear a U.S.-West German confrontation over TASM's could be the next big fight over nuclear strategy.

Are you concerned about this possible outcome and do you see this as a potential risk if the United States fails to resist West German pressure to cancel the modernization of the Lance?

Dr. VAN CLEAVE. Well, as you know, Senator, better than I, one can describe a political situation from entirely different perspectives, and our own interpretation can influence reality. What I have cautioned in my statement about is turning what seem to be the trends now into a self-fulfilling prophecy, or inevitability.

The political reality today as I would phrase it is not quite the way that Ambassador Nitze phrases it, which is that we are pressuring the Germans toward an enormously difficult political act of keeping these systems on their soil, and modestly modernizing them. The Germans have had the short-range systems on their soil for a long time. They are there for deterrence and the defense of German soil.

All we are asking them to do is to proceed with the modernization that they themselves, along with other members of NATO have agreed upon as essential to the preservation of effective weapons of this type in the theater. Their effectiveness is certainly central to the defense of United States forces, as well as the defense of German territory, and the effectiveness of NATO strategy.

I do not think it is an act of political atrocity to insist that they continue with this. It is a matter of political leadership, and of Alliance cohesiveness.

One of the problems we have today with public opinion in Germany is that there is a failure of leadership in the German Government. The German Government ought not simply to let public opinion turn that way much less encourage it. As leaders of the Alliance, I do not think that we should stand by and let the German's renege on their agreement to the modernization of these weapons. They should be made to understand the full potential political implications of doing so.

Now, German opinion can change, as in any democratic society, with the right change in events that we cannot predict, or the right application of leadership. Mr. Nitze, in fact, has suggested that we can sustain German support for modernization, if we only indicate that we are willing to reduce the forces.

I pointed out that, yes, that was certainly the nature of the Montebello decision, but we are facing an entirely different matter when we are talking about negotiations, which I think at this point in time will only encourage the continuation of trends in Germany toward a third zero and against modernization. We will end up with the reductions but not the modernization. We must also remember that numbers count and further TNF reductions could hurt us.

While there are exceptions, the thrust of our experience is that arms control negotiations, particularly when reductions are impending, have an adverse effect on modernization. I think that is fairly supportable and even documentable.

Let me now take the question raised by Senator Exon about Lothar Rühl. Mr. Rühl has been an acquaintance, a friend of mine, for many years. I did not see his recent statement but I find it regrettable, because I know that is not his personal opinion. Mr. Rühl has favored short-range TNF modernization. I have a transcript of meetings we had in Berlin last year with Rühl and several other Germans, where they not only agreed, they argued the need for Lance modernization.

So what Rühl is doing, like the German Government, is catering to his reading of German public opinion, when I think he ought to be trying to lead it rather than read it.

Senator WALLOP. Thank you, Mr. Chairman.

Senator EXON. I am advised by staff that the statement that I referred to was by Volker Ruhe, not Lothar Rühl. And maybe we are just mixed up in the pronunciation of German names.

Dr. VAN CLEAVE. Well, it is personally a relief to me, anyway.

Senator EXON. Senator Nunn. Thank you, Senator Wallop.

Senator NUNN. I think Senator Levin was next.

Senator EXON. Senator Levin.

CONVENTIONAL AND STRATEGIC FORCES IMBALANCE

Senator LEVIN. Dr. Van Cleave, on page 6 of your statement and in your oral remarks, you make reference to what would be the result of a deal at a level of 200 or 150. You have a couple of problems with that deal.

Dr. VAN CLEAVE. Yes, sir.

Senator LEVIN. The first is, you wrote, "the assumption that we would be able to resist successfully the third zero in the process." I think probably Ambassador Nitze would say he does not assume it, but argues that it would be easier to avoid a zero if you began negotiations to get to a level other than zero than it would be if you resist those negotiations.

But nonetheless, I at least see your argument. I can understand that argument that you make, that in your opinion it could lead to zero or would lead to zero and therefore would be dangerous from that perspective.

I do not understand your second problem with getting down to an equal level of say 200 or 100, as you put orally, and that is that such a deal by itself leaves and magnifies the conventional and strategic forces imbalances. I do not see how getting down to a

level of 100 or 200 could magnify conventional or strategic imbalances. I do not follow that.

Dr. VAN CLEAVE. You would need to put together the entire chain of logic: first, my dubiousness that we would be able to reach equal levels of that particular type; but second, I guess in a strategic or an operational sense, I would probably have to argue with Mr. Nitze that I do not think 100 or 200 short-range weapons are enough to cut into the conventional force imbalance or to give a credible extended deterrent, especially if those are the total numbers. Given the nature of the current strategic force imbalance, which is the most important thing in my judgment, and I believe probably Ambassador Nitze agrees with that, we cannot place even more reliance on it for extended deterrence. The strategic force balance really determines the extent to which theater imbalances are important or magnified in importance.

Senator LEVIN. I am going to ask Ambassador Nitze in a moment to comment on that strategic force imbalance. But I want to get back to your statement.

How many of these systems do we have now in Europe?

Dr. VAN CLEAVE. Which ones, sir?

SHORT-RANGE LAUNCHERS

Senator LEVIN. The short-range launchers.

Dr. VAN CLEAVE. Well, if you are only looking at the Lance launchers, I believe there are 88. But if you are looking at the artillery, there are a couple thousand.

Senator LEVIN. I thought you were talking about short-range systems excluding artillery.

Dr. VAN CLEAVE. No, sir, I did not mean to say that. I thought we were addressing reductions in all short-range systems. The negotiations, according to the communique, however, would be restricted to short-range missile systems. That is one thing.

But I was referring to short-range systems or, synonymously, tactical nuclear forces, as indicating all of those in the theater under 500 kilometers. And I would not wish to see all of those reduced.

Senator LEVIN. Well then, your testimony, it seems to me, is a little bit confusing. You say:

The proposal to proceed immediately to a reduction agreement on the short-range systems posits a bargain similar to that of the INF Treaty. The Soviets, with 1,500 launchers, and the United States, with only 88.

So you were referring in that paragraph to the 88. How is it possible that if they have 1,500 of something and we have 88 of something that agreeing 100 of the same thing would—

Ambassador NITZE. Not the same thing. Excuse me, I did not mean to interrupt.

Dr. VAN CLEAVE. No, that is all right, please. We can do this informally.

Ambassador NITZE. I think the 88 refers to launchers.

Dr. VAN CLEAVE. Launchers, yes.

Ambassador NITZE. While I was talking about 200 or 300 missiles.

Senator LEVIN. You were talking about missiles, not launchers.

Ambassador NITZE. Missiles, 200 or 300 missiles, not in terms of launchers.

Senator LEVIN. So that would, in your view, represent a reduction for us as well?

Ambassador NITZE. It would represent a reduction for us.

Senator LEVIN. From what to what?

Ambassador NITZE. I think we have about 600 today.

Senator LEVIN. OK, so now I understand what you were referring to. So you would say that to cut us from 600 to 300 would be acceptable if they had to go from 1,500 to 300?

Ambassador NITZE. They would have to go from some 6,000.

Senator LEVIN. 6,000 weapons to 300.

Ambassador NITZE. 300.

Senator LEVIN. I have got it.

Dr. VAN CLEAVE. Senator, equal missile ceilings at levels far lower than current Soviet levels is obviously better than the current disparity, and I think anybody with common sense would agree to that.

But, having said that, we cannot treat a hoped-for future as if it were present reality—

Senator LEVIN. I understand.

Dr. VAN CLEAVE [continuing]. And ignore all the intervening practical difficulties that I have laid out in the statement.

You have remaining questions of timing of these negotiations, of relationships of developments in the strategic force level and the conventional level to the numbers. How do we know the correct numbers for short-range TNF unless we know these other things first?

We also have questions of feasibility, verifiability, and enforceability, and these are very important and practical problems, it seems to me.

Senator LEVIN. Just on the confusion on the numbers, you might want to take a look at the oral testimony here, because I think you were referring to the 100 or 200 as launchers in your oral testimony and I do not think that is what you intended to say, because you were comparing 1,500 launchers.

Dr. VAN CLEAVE. I see.

Senator LEVIN. In your oral testimony, you said if you got down to 100 or 200, and you were referring in that context to launchers, that would magnify a problem.

Dr. VAN CLEAVE. No, I think the principle stands, whatever the unit or whatever the number used. In my paper I referred to 50 and I was referring to launchers. Mr. Nitze, referring to 100 to 200, was referring to missiles.

But I think the principle stands, whichever unit or number you use.

Senator LEVIN. Any reduction in our forces, even though there were a 10 or 20 reduction in their forces, would, in your view, constitute a magnification of an imbalance?

Dr. VAN CLEAVE. No, not any. I think you have to treat this to some kind of strategic analysis and judgment based on specific balances from the conventional to the strategic.

Senator LEVIN. Well, cutting from 88 launchers to 50 would do that?

Dr. VAN CLEAVE. No, I would not say that necessarily. What and how many missiles? What of the artillery? But I again prefer, as a matter of timing, that we proceed, as the government has decided to do, with the conventional force negotiations first and see the outcome. And I would argue even more strongly for doing the same with the START agreement.

Senator LEVIN. Well, I still am confused by your testimony, because now we are talking apples and apples, not apples and oranges. We are talking launchers. When you say such a deal by itself, now referring to reductions in launchers by both sides to 50 launchers, you say "Such a deal by itself leaves and surely magnifies the conventional imbalance."

Dr. VAN CLEAVE. I believe it does. I believe that is clearly the truth, because we have to understand what reliance we place on those forces and what we do to the effectiveness of those forces if we reduce them like that, particularly if we do not modernize, and the conventional strategic imbalances remain as they are now.

We have sufficient problems today with ensuring adequate survivability of forces with the numbers that we have. We are going to have more problems with that survivability if we reduce those numbers, unless we do a lot of other things, and I want to see what those other things are.

Senator LEVIN. My time is up. Thank you very much, Dr. Van Cleave.

Senator EXON. Thank you Senator Levin. Senator Nunn.

SHORT-RANGE NUCLEAR FORCE POSTURE

Senator NUNN. Pursuing that question, may I ask both of you, do you believe that our eventual short-range nuclear force posture in terms of types, numbers, and so forth is dependent in terms of requirement on the outcome of the conventional discussions?

Another way of asking that: Do you think we can now project without knowing the outcome of the conventional forces negotiations what our long-range, short-range systems should be?

Ambassador NITZE. I cannot imagine any situation in which we would not be ahead of the game if we could get an equal balance in the short-range missiles, rather than a gross imbalance against us. I think it is just a good thing militarily to reduce the Soviet superiority at this level of the short-range missiles.

I am talking about short-range missiles, not everything else involved here, because there are two different effects. One of them is what would the military effect be on the battlefield; and another is the psychological effect of the linkage to strategic nuclear balance.

Mr. Van Cleave says we should not transfer any more weight into the strategic thing. I tend to agree with that, but I do not believe that there is any point in escalating to a level of nuclear warfare where the cards are all certainly stacked against us, and I just do not think that has any addition to the credibility of our deterrent. But we would be just better off if there were equal levels at this in the short-range missile field.

I agree that there are some difficulties with respect to verification. If we do not have a deal, then you certainly do not have any verification because there is nothing to verify, and clearly the Sovi-

ets can build any goddamn missiles they want to build, with any modernization they want to do.

Dr. VAN CLEAVE. And so could we.

Ambassador NITZE. And so could we, but we are not going to. You have got to look at the reality of the situation, the budgetary situation we face. We have got budgetary difficulty. We have got all kinds of problems of going into an all-out competition with the Soviets in this field of short-range missiles.

At one time we thought there was some advantage to us in that, because we knew we were going in the wrong direction with conventional forces and we thought we could offset this by concentrating on the tactical nuclear weapons. And for a long period of time we failed to look at what would happen if the Soviets also had short-range or tactical nuclear weapons, not necessarily equal to ours but roughly equally to ours.

Then all the advantages of being able to rely on the short-range missiles began to go away. If you ask—we would run into people who would say: Well, we would start the use of nuclear weapons and this will offset our conventional imbalance.

Well, then you say: What happens in the event we start using short-range missiles or tactical nuclear weapons and the Soviets respond? Are we going to be better off in that? And it turns out we would not.

People found it very hard to find any scenario in which adding exchanges in the tactical nuclear field really helped us any militarily.

Dr. VAN CLEAVE. I do not agree.

Senator NUNN. Dr. Van Cleave?

Dr. VAN CLEAVE. I do not agree with that proposition at all, and it also bears, I think on the question of the numbers, because one of the purposes for which we have tactical nuclear weapons in the theater is to try and reduce the options the other side has for conventional attack, such as massing for an attack.

Another reason we have them there is to prevent critical breakthroughs that could so destroy American or western defenses that it is necessary to try to prevent that destruction. And this at least has the advantage, at least potentially, of buying time to make decisions on further escalation or on the use of Mr. Nitze's external or strategic forces.

If we did not have that capability, we would not have the time to do that. I, myself, have always thought the scenario in which the Soviet Union made the profound political decision to launch an all-out assault on Western Europe and did not, in view of our vulnerabilities, elect initial or very early use of nuclear weapons itself was not very credible. So I do not want to emphasize too strongly an American first-use scenario.

But nonetheless, NATO has relied on that scenario and our TNF have played an important role in our defenses. They do bolster an inadequate conventional defense and they do provide some linkage, whatever your judgment as to its utility, to wider use of nuclear weapons.

Now, if you would argue that it is in the interest of both sides to avoid widescale, large-scale use of nuclear weapons, then defensive use of our TNF imposes another new decision on the Soviet Union.

Once we use nuclear weapons on our own soil to prevent an aggression from being successful, the Soviets must decide whether wider scale use of nuclear weapons is in their interests.

Some people argue today that they do not want to do that. I do not necessarily share that judgment, but we do not want to take away that problem for them by not having the forces there. We do not want a situation where a conventional attack can be effective or where, for that matter, a very selective use of their nuclear weapons with low collateral damage could be effective, and the only thing we could do is resort to strategic forces. I do not think that is a deterrent.

Ambassador NITZE. Bill and I do not differ that much, really, because I also agree that we ought to—there is some value in having some of these short-range missiles, even though I have a hard time figuring out what their net military utility is.

But still, there is some linkage. There is some effect upon the way in which they will deploy their conventional forces in Europe. So that is why I am for having, say, 200 or 300 of them.

But I have great difficulty in seeing why there is any advantage to us in continuing in a situation where they have this enormous superiority in this field. I think we ought to try to get rid of that superiority. And at some level—if it were 500 I would not object to that if it were 200 I would not object to that, but it has to be above zero, I think—it would be better to have them—

Dr. VAN CLEAVE. You are willing to risk the elimination and the modernization of the forces and depend on an arms control agreement where the Soviets are going to be so cooperative?

Ambassador NITZE. I do not know what I am risking when you say I am risking modernization, because I do not believe you can get modernization by refusing to negotiate with the Soviets on this issue. It is just inconceivable to me that that is going to help you get modernization.

Dr. VAN CLEAVE. Well, I differ, and I believe that the proper way to deal with this is to defer these negotiations until we have concluded the negotiations on the other forces and see their outcome and until we have firm commitments to modernization.

Ambassador NITZE. It seems to me to make no logical sense. I think if I am right that there is some chance of getting equal levels at some greatly reduced level which would eliminate the Soviet superiority, I cannot see any situation in which that would be other than helpful, no matter what the level of conventional forces.

Dr. VAN CLEAVE. Again, you are using a hoped-for future, because it is a possibility, as if it were a statement of reality. And one must caution against doing this.

Ambassador Nitze. I cannot imagine any level.

Dr. VAN CLEAVE. You are omitting all the risks of charging into these things. You are omitting all of those risks entirely.

Ambassador NITZE. Risks? What risks?

Dr. VAN CLEAVE. The risks that they, as I said, would only impart new momentum to both the Soviet demands for denuclearization and the German propensity for denuclearization, the risk that while you are negotiating for these reductions you have got a powerful force against proceeding with modernization, not for proceeding with it, in my viewpoint.

And I think those risks are too great to take.

Senator NUNN. I have a hard time finding anyone in Germany on either side of the political spectrum who is in favor of modernization as we define it now, the posture we are in now, without negotiating. I do not know how it is going to get much worse by negotiating when there is adamant opposition from every point of the spectrum at this stage without negotiating.

It may not get better, but I have a hard time conceiving how it is going to get worse.

Dr. VAN CLEAVE. Well, Senator, I do not want to get myself in the position—

Senator NUNN. What can be worse than having all political parties united on not being willing to give us any commitment on the follow-on to Lance, and the Congress being in the situation of being asked to put up some \$330, \$340 million to build a system at this stage over the next 3 years that nobody in Germany will even whisper privately is going to have a chance of being deployed?

I mean, what is worse than that in terms of modernization?

Dr. VAN CLEAVE. In my own view, I think the last was a bit of hyperbole, since I know a lot of people in Germany who will at least whisper that they ought to be deployed, even though they may not say so publicly. And our own forces need them, and other allies agree.

Senator NUNN. I have not met them.

Dr. VAN CLEAVE. Well, Lothar Rühl, who we just discussed, is one, I believe. But there are others as well, including discussions I had recently with the chairman of the Bundestag's Defense Committee.

Senator NUNN. I would like to hear from those people, privately or publicly, because I am just not running into that point of view. I am having even military officials tell me—

Dr. VAN CLEAVE. So I understand.

Senator NUNN [continuing]. That they just are not going to do it, not only this government, but no government. It may change. As you say, democratic societies change. But I think if it is going to change, it has got to be something within NATO to help create that change.

I do not think we can sit around and wait for external miracles.

Dr. VAN CLEAVE. I agree. But the reason the Congress should spend this money to do this this year is precisely to keep that option alive, rather than to foreclose it.

Senator NUNN. Well, the amount of money this year is not that amount, considerably less than that. We are talking about over 3 or 4 years.

I certainly favor continuing to develop the Lance Follow-On at this stage. But as the budget gets squeezed it is going to be harder and harder. NATO now is not talking about making a decision after the 1990 election, they are talking about making a decision after 1992.

Dr. VAN CLEAVE. Yes, sir. And if we reduce the modernization issue only to the Lance Follow-On, then I would agree that we have probably lost the modernization issue already.

Senator NUNN. It is much broader than that, and I think we have to treat it as much broader.

Dr. VAN CLEAVE. I agree. I also recognize the weakness of my position in arguing for a more thoroughgoing modernization, inasmuch as our track record in modernizing the tactical nuclear forces is almost as black as our track record in arms control.

FUTURE OF NUCLEAR ARTILLERY

Senator NUNN. What about the future of nuclear artillery? I would like to ask both of you that. Two parts of that question. One is the future of it militarily; and the other, the future of it politically in Germany. Ambassador Nitze?

Ambassador NITZE. As I see it, at least from my recollection of the various times this problem has come up in the past, the principal problem with dealing with the nuclear artillery is the impossibility of distinguishing an artillery tube that can fire nuclear munitions and one that fires conventional munitions.

So the only way through that is to consider every artillery tube of a given size and characteristic as being capable, as being nuclear-capable, and if you do that you cover 10,000, 20,000, 40,000 pieces of artillery on the Soviet side. And the best way of getting at that I think is to just go forward with the reductions that are implied by the NATO position, which the Soviets seem to be moving closely toward, with respect to the general reduction in artillery tubes, particularly self-propelled artillery.

So if you could get that down, it still leaves you with 20,000 tubes in Europe or some such figure, and that is an enormous number. And clearly, if you can put nuclear munitions in them you really effectively have no limitation on the amount of nuclear artillery or nuclear-capable artillery that threatens Europe. And how you deal with that I do not know.

Dr. VAN CLEAVE. That is certainly the arms control problem of it. But you could turn that around, too. The dual capability and dual role are certainly inherent in the artillery, as it is in other short-range systems.

The opposition in the United States to utilize dual capability is partly an arms control concern, but we cannot do anything to change the dual capability of Soviet artillery.

Part of the opposition or resistance is based on a concern that the nuclear component would reduce the conventional effectiveness of the system or reduce our commitment to conventional force strengthening. Part of it is based on the opposite, that the conventional element would hamper the nuclear. Part of it is based on arms control.

But in particular, since the Soviets are bound to take advantage of this denuclearization potential anyway. I think it would be folly on our part to ignore it ourselves in the name of some hoped-for arms control agreement then. If you look at it a different way, then it confers potentially many advantages, because if we must be concerned ourselves about not being able to single out Soviet nuclear artillery from the thousands of tubes, then the Soviets likewise cannot single out American nuclear artillery from the thousands of tubes, and hence you have an inherent survivability in those systems that is not inherent in larger systems that are more easily locatable.

And therefore, I would argue that we might emphasize the artillery and the shorter range systems as inherently the most survivable because they are the most difficult to target, and therefore the most stabilizing, rather than destabilizing. Also, because, (A) they present no attack threat to the other side, they are only defensive weapons in any case, and therefore in that regard not very escalatory; and (B) because there are so many, they are not individually as highly lucrative a target as some of the longer range systems.

Senator NUNN. What about politically in Germany?

Dr. VAN CLEAVE. We have some 2,000 nuclear artillery tubes in Germany right now. All we are talking about is modernizing them so they are more safe, more responsive, more survivable, and create less collateral damage.

I do not see why that should be a difficult logical case to make, however difficult it seems politically right now.

Senator NUNN. Ambassador Nitze?

Ambassador NITZE. What we have been doing in the past is reducing the inventory in Europe of artillery shells, and so we have made a great thing of the fact that we have come down from what once was what, 9,000?

Dr. VAN CLEAVE. 7,000 to 4,000.

Ambassador NITZE. 7,000, and we are down now to 4,000. And we have made a good deal of propaganda out of that, that we are reducing these shells. But there is a pressure clearly in Germany for further reduction.

But the problem with this is it gets down to unilateral reductions on the western side, and there is not assurance that there is going to be a comparable reduction on the Soviet side. You may be able to get a declaration from them that they will reduce their nuclear artillery if we do, but I do not believe that you can get—I do not see how it is going to be verified in any useful way.

Senator NUNN. I want to thank both of you for being here.

Senator Exon has to depart and I do not think he is going to be able to get back here. We now have a vote pending on the floor, so I guess it is about as good a breaking point as any.

You have always been very helpful over the years and today is no exception. We appreciate very much your participation. Thank you.

[Whereupon, at 12:09 p.m., the subcommittee was adjourned.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEARS 1990 AND 1991

— THURSDAY, JUNE 15, 1989

U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC FORCES
AND NUCLEAR DETERRENCE,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

BUDGET REQUEST FOR THE STRATEGIC DEFENSE INITIATIVE

The subcommittee met in executive session at 1:08 p.m., in room SR-222, Russell Senate Office Building, Senator J. James Exon, (chairman of the subcommittee) presiding.

Committee members present: Senators Exon, Nunn, Levin, Bingaman, Glenn, Gore, Warner, Thurmond, Cohen, Wilson, Wallop, and Gorton.

Committee staff member present: Arnold L. Punaro, staff director.

Professional staff members present: Robert G. Bell, Sherri W. Goodman, John J. Hamre, William E. Hoehn, Jr., T. Kirk McConnell, and Michael J. McCord.

Minority staff members present: Patrick A. Tucker, minority staff director and counsel; Brian D. Dailey, George W. Laufer, and John E. Mansfield, professional staff members.

Staff assistant present: Mickie Jan Wise.

Committee members' assistants present: Jeffrey B. Subko, assistant to Senator Exon; Kenneth N. Luongo, assistant to Senator Levin; William J. Lynn, assistant to Senator Kennedy; Edward M. McGaffigan, Jr., assistant to Senator Bingaman; Donald A. Mitchell, assistant to Senator Glenn; Terrence M. Lynch, assistant to Senator Shelby; James M. Bodner, assistant to Senator Cohen; Dudley L. Carlson, assistant to Senator Wilson; Jack D. Crouch II, assistant to Senator Wallop; Robert M. Soofer, assistant to Senator Gorton; and Charles G. Percy, assistant to Senator Lott.

OPENING STATEMENT OF SENATOR J. JAMES EXON, CHAIRMAN

Senator EXON. The subcommittee will please come to order. I want to start out by saying that I hope the witnesses will notice that we do not have the microphones on today. We are not going to have any open hearings today, so there will be no microphones.

Therefore, we ask you to speak up a little louder than you might if you had a microphone in front of you.

We meet today in closed session to receive testimony on the Strategic Defense Initiative and the compliance of the planned SDI work program with our international obligations, in review of S. 1085, the DOD authorization bill for fiscal years 1990 and 1991, which we shall mark up next month.

We have four distinguished witnesses arrayed in two panels this afternoon, due to some special circumstances. Our first panel today consists of Ambassador Paul Wolfowitz, the Under Secretary of Defense for Policy; and Gen. Robert Herres, the Vice Chairman of the Joint Chiefs. Since there is no Under Secretary for Acquisition in place, General Herres, as a member of the Defense Acquisition Board, may have to do double duty on some of the Milestone issues.

These two distinguished witnesses will offer testimony on broad policy issues relating to the SDI program, on the compliance of the planned research program, and on the JCS requirements for Phase I systems now in R&D. Because both of these gentlemen must be at an NSC meeting at the White House at 3 o'clock, we have moved up the starting time of this hearing and arranged to hear their testimony and question them first.

I want to welcome both of you gentlemen here today.

Our second panel then will follow. It might be necessary that the second panel might be called upon to help answer some of the questions that are asked of this panel, but we hope we can give priority to questions for the first panel in order to accommodate the time restraints of the first two witnesses.

The second panel, which will begin no later—and I emphasize, no later—than 2:45 p.m., will consist of Gen. John Piotrowski, who is well known to us and has been here before. The General is Commander in Chief of the U.S. Space Command. Lt. Gen. George Monahan, Director of the Strategic Defense Initiative Organization, is also well known to this committee.

They will offer testimony on operational requirements of Phase I SDS and the details of the fiscal year 1990 SDI programs. I will welcome them briefly at the beginning of their panel.

Since we have much ground to cover and our first panel has definite time limits on their attendance, I intend to move expeditiously. Without further ado then, I will recognize the witness, with the understanding that my distinguished colleague, Senator Thurmond, will be here soon. At an appropriate time we will recognize him for his opening remarks.

Are there any other opening remarks by members of the panel?
[The statement of Senator Strom Thurmond follows:]

PREPARED STATEMENT OF SENATOR STROM THURMOND

Thank you, Mr. Chairman, I join you in welcoming the witnesses before the subcommittee. I want to especially welcome Mr. Wolfowitz and General Piotrowski since this is their first appearance before the subcommittee on the SDI program. Your testimony is welcomed since you will each provide a unique perspective to the SDI program that will be most useful in our deliberations of the budget. Mr. Wolfowitz, I believe that you can provide us with a policy perspective on the program, while General Piotrowski can give us his view of the operational issues associated with defenses since he is the commander in charge of strategic defenses, when they are deployed. This will be an important adjunct to the testimony of Generals

Herres and Monahan who have testified before the committee on other occasions. I am sure their testimony will be of the same high caliber as those in the past.

Since we last had testimony on the SDI program there have been a number of important events. Budgetary pressures *etc.*, of course, the most notable problem facing the defense budget, today. I am concerned that many will look to the SDI budget as a source of funds to pay for other defense programs. In my opinion this would be a devastating blow to the program. SDI is an important program to the President and, I believe, the country. I will strongly discourage any effort by members to use SDI funds for other programs. I hope General Monahan can give us an overview of what impact such cuts would have on the program.

Finally, there have been enormous breakthroughs in SDI technology. The result of these breakthroughs in technology have allowed us to reexamine our current concept of defense. Specifically, the Brilliant Pebbles program looks most interesting as a way to deploy defense in space. I look forward to hearing about Brilliant Pebbles and what progress has been made in the program.

Thank you, Mr. Chairman.

Senator EXON. If not, we will go right to you, Mr. Secretary. And once again, we welcome you.

STATEMENT OF HON. PAUL D. WOLFOWITZ, UNDER SECRETARY OF DEFENSE FOR POLICY

Ambassador WOLFOWITZ. Thank you, Mr. Chairman. We appreciate very much this opportunity to appear before you and address this very important subject. We also appreciate, General Herres and I, your courtesy in arranging this so that we can get out in time for our 3 o'clock commitment.

We may at some junctures want, for some questions at least, to have our colleagues, General Monahan and General Piotrowski, answer some portions of the questions. We will see as that proceeds, but at least why do we not begin with our opening statements.

I have submitted an advance copy of my statement. I would like to ask that that be made part of the record.

Senator EXON. Without objection, that will be included in the record. Will you please summarize.

Ambassador WOLFOWITZ. Let me just try to present it in a somewhat shorter compass.

Mr. Chairman, the nature of the strategic threat we face has changed and will continue to change over the next decade. While the basic missions of strategic forces have remained fundamentally constant over the last 40 years, our capabilities have changed dramatically over time. Until the early 1960s, the United States relied on our massive strategic superiority.

If deterrence failed, we would retaliate with all-out offensive attacks on the Soviet Union and its strategic offensive forces and use effective layered air defenses to limit damage from Soviet forces.

But the Soviet nuclear capability grew in the late 1950s and early 1960s and the United States shifted to a strategy of flexible response. It was during this period also that we began to deploy the triad of strategic forces, which over the years has provided a secure deterrent even though deficiencies might emerge from time to time within a particular leg.

The increasing importance of ballistic missiles in the Soviet arsenal by the late 1960s meant that air defenses would be increasingly ineffective in limiting damage from an attack. Initially, we attempted to respond by developing ballistic missile defenses.

In 1972, however, we took a major step away from defenses by signing the ABM Treaty. There were two rationales offered for the treaty: first, that the technology of the time did not permit truly effective defenses, but instead only ground-based, limited area defenses, relying on nuclear-armed interceptors that could be easily countered.

Second, some people believed that the development of defenses would lead to a destabilizing action-reaction scenario. They hoped that the abandonment of ballistic missile defenses would eliminate any incentives for the Soviets to proliferate offensive forces and encourage offensive reductions—a hope that I must point out was sorely disappointed.

After the ABM Treaty was signed, the United States made little effort to defend against Soviet strategic nuclear attack, either from ballistic missiles or from bombers. Our defensive efforts were basically confined to passive measures, such as hardening of ICBM silos and critical command and control facilities.

I would point out, though, we spend a lot on those kinds of passive defenses of our strategic deterrent, and we will continue to do so for the foreseeable future.

During this same period, the Soviet Union took a very different approach. Soviet strategy offensive forces are structured to provide a counterforce first strike capability. To limit damage from those U.S. weapons that they could not destroy in a counterforce attack, the Soviets also place emphasis on active defenses.

They have a very extensive air defense and a modest deployed ABM system. Modest, but nonetheless one which in some respects exceeds the limits of the ABM Treaty.

We are concerned that the Soviets could field a widespread defense using rapidly deployable ABM components, although we judge such a deployment to be unlikely through at least the mid-1990s.

Moreover, the Soviets have long maintained an aggressive program to develop advanced defenses against ballistic missiles. However, such defenses, if deployed, would not prevent massive damage to Soviet society.

The Soviets also invest heavily in passive defenses, including reinforced silos, protected facilities for key leadership elements, and civil defenses for certain segments of the industrial base and population.

In the 1980s, building on an ongoing R&D program, the United States responded to Soviet counterforce and defensive improvements by increasing the accuracy, the penetration capability, and the survivability of our strategic offensive forces, and by improving the survivability of critical command and control assets.

We also began re-examining the potential role of active defenses, establishing the Strategic Defense Initiative to conduct a broad-based research and development effort to determine the feasibility of effective ballistic missile defenses.

In part, our desire to pursue SDI was based on a survey of the technological capability of the United States, which led to the conclusion that the state of the art of defense had progressed to the point where it was reasonable to investigate whether new technologies could yield options which could permit us to turn to defense,

not only to enhance deterrence, but to allow us a more secure and long-term basis for deterrence.

Upon entering office, President Bush called for a comprehensive review of our national security strategy and objectives. In doing so, he pressed us to challenge assumptions concerning previous national security policies and programs, including SDI.

We did, and based on that review, have determined the following with respect to the SDI program:

First, the goals of SDI remain sound. In this regard, in pursuing SDI we do not seek superiority, but rather to maintain the strategic balance and to place deterrence on a more stable basis.

Second, pursuit of a robust SDI program provides a hedge against any near-term Soviet decision to rapidly expand its antiballistic missile capability beyond that allowed by the ABM Treaty, and, I might add, it provides some deterrence against Soviet violations of compliance with that treaty.

Third, we will continue to aggressively pursue options for layered defenses composed of both space and ground-based elements, recognizing that layered defenses offer substantial advantages in terms of defense effectiveness and in imposing uncertainty on Soviet war planners.

Fourth, we will place emphasis on program flexibility and continue toward deployment of a system that will meet the requirements of Phase I Strategic Defense System, as those requirements have been defined by the Joint Chiefs of Staff, particularly focusing on evaluating the potential of the most rapidly advancing technologies, such as Brilliant Pebbles.

Fifth, the SDI program is to be conducted in full compliance with all U.S. international obligations, including the ABM Treaty.

And sixth, in recognition of fiscal constraints, we have reduced the budget request for fiscal year 1990 and later years. Here we must concede that the reduction in the SDI budget request for fiscal years 1990 and beyond may cause a slip in the date in which effective defenses could be deployed. On the other hand, technological advances, and in particular Brilliant Pebbles, should it prove to fulfill the most optimistic expectations for that technology, could actually allow the schedule to advance.

What does the President's decision say about our views on the scope and purpose of SDI? First, the decision takes into account SDI's long-term goal of developing, if feasible, defenses against ballistic missiles that could be so effective as to permit a fundamental shift in our strategy from emphasizing the threat of retaliation to emphasizing direct denial of Soviet war aims and providing a true damage-limiting capability for the United States should deterrence fail.

Further, the President's decision recognizes that the national debate over SDI has tended to focus perhaps too much on this long-term prospect of a fundamental shift to defense dominance. In point of fact, the deployment of active defense need not necessarily be a radical departure from current U.S. deterrence strategy.

As I noted earlier, we already spend a great deal of money to protect elements of our strategic forces and our strategic command and control by passive means, such as mobility, stealth, and hardening. In addition to the capability to limit damage to the United

States, for example, in event of an accidental launch of a small number of missiles, active defenses could be used in combination with passive means to protect elements of our strategic deterrent or our strategic command and control.

Furthermore, one can envisage a U.S. offensive-oriented deterrent augmented by modest or moderate levels of defense, in the early stages of defensive deployments, that could move us toward a new strategy of deterrence through direct denial as the defenses become increasingly robust. Depending on their effectiveness, active defenses could also provide protection against different levels of Soviet and third country attack.

In deciding in favor of pursuing options for layered defenses, the President recognized that such defenses would provide a significantly greater contribution to deterrence and defense than could be afforded by purely ground-based defenses.

Used in a preferential, adaptive manner, layered defenses could provide increased protection for mobile missiles needing dispersal or for a range of selected military targets, including ICBM silos, command, control, and communications facilities, weapons storage sites, conventional military bases, conventional military forces in our projection force, or critical war-supporting facilities.

Active defenses of this kind would also provide a firm foundation for progressively more capable defensive deployments.

Furthermore, the President was cognizant of the fact that, although defenses of this level of effectiveness could not protect the entire U.S. population against a full-scale strike, they could provide meaningful population protection against ballistic missile attack in a limited conflict.

It was recognized in this decision that the Soviets may very well take steps to reduce the effectiveness of any U.S. defensive deployments. As we proceed in our evaluation of options generated by SDI research, we will consider the degree to which certain types of defensive systems by their nature encourage an adversary to attempt to overwhelm them with additional offensive capability, while other systems might discourage such a counter-effort.

We seek defensive options, as we do with other military systems, that are able to maintain capability in the face of countermeasures that could be taken to try to defeat them.

Now I would like to turn to other policy matters related to SDI. We are encouraging participation in the program by our allies. Since SDI began, we have negotiated and signed memoranda of understanding with five of our allies to facilitate their participation in the program.

While such an MOU is helpful, it is not mandatory for participation, and organizations in countries that have not signed an MOU have successfully competed for contracts. This arrangement has helped our allies understand SDI much better and has made available to us additional technical expertise to help advance the research.

Also, we wish to pave the way for a cooperative transition to a world in which effective defenses against ballistic missile attack could play an increasing role in assuring deterrence. We are pursuing this objective with the Soviet Union in the Defense and Space Talks.

In particular, we wish to build on the agreement concerning defense and space issues reached between President Reagan and General Secretary Gorbachev at the Washington summit in December 1987. The heart of the agreement at the summit was that the United States would agree to a specified period during which neither side would withdraw from the ABM Treaty, in return for acknowledgment of our existing rights under the terms of the ABM Treaty to conduct research, development, and testing of certain ABM systems, as well as the right to deploy defenses at the end of the non-withdrawal period without further reference to the treaty.

Senator GORE. Mr. Chairman, is it appropriate to ask a question at that point briefly?

Senator EXON. Well, I would prefer not to.

Senator GORE. Well, he has referred to an agreement that I never heard of.

Senator EXON. Well, you will have an opportunity.

For some of you who came into the room, I note that this panel has to leave at 2:45 and we are trying to move quickly ahead.

Senator GORE. I apologize.

Senator EXON. I think we had better follow the regular procedure.

Ambassador WOLFOWITZ. I could just say briefly, Senator Gore, what I was referring to was in the language that was agreed on at the 1987 summit here in Washington. But we can discuss that later.

Senator GORE. I thought that might have been what you were referring to, but it is hard to recognize from the description here.

Ambassador WOLFOWITZ. Well, we can clear that up later if you like.

Senator GORE. All right.

Ambassador WOLFOWITZ. The heart of the agreement at the summit in our view was that, while we would agree to a specified period during which neither side would withdraw from the treaty, in return we had acknowledgment of our existing rights under the terms of the ABM Treaty to conduct research, development, and testing of certain ABM systems and the right to deploy defenses at the end of the non-withdrawal period.

This position supports fully the SDI program and U.S. national security objectives, in that it protects our right to investigate defensive technologies, enables us to discuss a cooperative transition with the Soviet Union, and to redress the current asymmetry in the ability to deploy strategic defenses.

In sum, then, in the Defense and Space Talks we seek an agreement that would help provide a stable, predictable basis for developing and testing advanced defenses against ballistic missiles and for deployment of such defenses when they are ready.

In the Defense and Space Talks, the Soviets continue to try to seek agreements that would place restrictions on our ability to conduct an energetic SDI program. We have rejected such proposals in the past, and for good reason. In fact, we cannot and must not close off promising avenues of technological research before they yield answers to the fundamental question: Can effective strategic defenses be proven feasible?

In conclusion, Mr. Chairman, President Bush has taken a long, hard look at the SDI program and has determined that the goals remain valid. The changing nature of the threats we face and the emergence of promising technical concepts argue strongly in favor of continuing to pursue an aggressive SDI program.

In addition, we must not succumb to Soviet pressures to constrain our research endeavors and allow them to maintain an edge in such a capability. The United States continues to have solid strategic and geopolitical interests in aggressively pursuing SDI, and we in the administration urge your strong support for this vital, complex program.

Thank you very much.

[The prepared statement of Ambassador Wolfowitz follows:]

STATEMENT OF THE UNDER SECRETARY OF DEFENSE (POLICY)
BEFORE THE SENATE ARMED SERVICES COMMITTEE

Mr. Chairman and Members of the Committee,

I appreciate the opportunity to appear before this distinguished panel today to provide some thoughts on the Strategic Defense Initiative (SDI).

This morning I will focus my discussion on policy issues concerning ballistic missile defense, and on the Defense & Space Talks in Geneva.

The most fundamental national security objective remains to preserve peace and freedom. The purpose of our military forces is to deter aggression and coercion based on the threat of military aggression. However, the nature of the strategic threat we face has changed, and will continue to change over the next decade. Unless we are prepared to respond to those new challenges and take advantage of emerging technologies, deterrence could be weakened or we might be forced to forego opportunities to strengthen it.

Allow me to describe the strategic context in which the President's recent decision on SDI was taken. An appreciation of this context should make it easier to understand the Bush Administration's belief that SDI should remain a vital ingredient in our efforts to enhance security and stability as we move into the 1990s.

U.S. strategic forces must be able to respond to either limited or massive attacks, to deny the objectives of the attack and provide incentives for Soviet restraint and war termination. Finally, U.S. strategic forces must provide the President with the ability to choose among a range of options tailored to the nature of the attack, rather than represent alternatives forced upon him as a result of the vulnerability of U.S. command/control/communication/intelligence (C3I) or strategic forces.

While the basic missions of strategic forces have remained fundamentally constant over the last 40 years, capabilities have changed dramatically over time, in response to changes in technology, policy, and the Soviet threat. Until the early 1960s, the United

States relied on our massive strategic superiority, including a substantial commitment to air defenses, to deter and if necessary defeat Soviet attacks on the continental United States and our Allies. If deterrence failed, the United States would retaliate with all-out offensive attacks on the Soviet Union and its strategic offensive forces, and use effective, layered air defenses to limit damage from these forces.

As Soviet nuclear capability grew in the late 1950s and early 1960s, the threat of a massive retaliation lost credibility, and the United States shifted to a strategy of flexible response. This required a mix of nuclear capabilities with the different ranges, flexibility and survivability required for limited, follow-on, and massive retaliatory attacks. During this period, the United States began to deploy a Triad of strategic forces which, over the years, has provided a secure deterrent even though deficiencies emerged within a particular leg.

The increasing importance of ballistic missiles in the Soviet arsenal by the late 1960s meant that air defenses would be increasingly ineffective in limiting damage from an attack. Initially, the United States responded by developing ballistic missile defenses. In 1972, however, the United States took a major step away from defenses by signing the ABM Treaty. Our rationale for doing so was two-fold. First, the technology of the time did not permit truly effective defenses, but instead only ground-based limited-area defenses using nuclear-armed interceptors, which could be easily countered. Second, there was concern that, given the state of technology, the development of defenses would lead to a destabilizing action-reaction scenario. We hoped that the abandonment of significant ballistic missile defenses would eliminate any incentive for the Soviets to proliferate offensive forces, and encourage offensive reductions.

After the ABM Treaty was signed, the United States made little effort to defend against Soviet strategic nuclear attack. Because we could not blunt the ballistic missile threat, and because the bomber threat was small, the U.S. air defense program became focused

primarily on providing warning of attack. U.S. defensive efforts were basically confined to passive defensive measures, such as hardening of ICBM silos and critical command and control facilities, posturing of bombers and SSBNs to achieve higher alert status, and providing for continuity of government.

At about the same time as the United States abandoned the effort to limit damage through active defenses, the emergence of new Soviet SLBMs and ICBMs effectively ended our ability to limit damage by attacking Soviet forces. The United States continues to hold Soviet nuclear forces and military capabilities at risk in an effort to undercut Soviet war aims, but not to limit damage from an initial Soviet attack, except through inducements to Soviet restraint.

During this same period, the Soviet Union took a very different approach. Soviet strategic offensive forces are structured to provide a counterforce first-strike capability; to limit damage from those U.S. weapons they could not destroy in a counterforce attack, the Soviets also place emphasis on defenses. They have a very extensive air defense and a modest deployed ABM system. We are concerned that the Soviets could field a widespread defense using rapidly-deployable ABM components, although we judge such a deployment to be unlikely through at least the mid-1990s. Moreover, the Soviets have long maintained an aggressive program to develop advanced defense^s against ballistic missiles. However, such defenses, if deployed, would not prevent massive damage to Soviet society. The USSR also invests heavily in passive defenses, including reinforced silos, protected facilities for key leadership elements, and civil defenses for certain segments of the industrial base and population.

In the 1980s, the United States, building on an on-going R&D program, responded to Soviet counterforce and defensive improvements by increasing the accuracy, penetration capability, and survivability of our deployed strategic offensive forces and the survivability of critical C3 assets. The United States also began reexamining the potential role of active defenses, establishing the Strategic Defense Initiative to conduct a broadly-based research and development

effort to determine the feasibility of effective ballistic missile defenses and to support a national decision in the early 1990s on whether to pursue a strategy which makes increased use of the contribution of active defenses. In part, our desire to pursue SDI was based on a survey of the technological capability of the United States, which led to the conclusion that scientific developments and several emerging technologies offered the possibility of defenses that did not exist and could hardly have been conceived earlier; the state of the art of defense had progressed to the point where it was reasonable to investigate whether new technologies could yield options which could permit us to turn to defense not only to enhance deterrence, but to allow us a more secure and stable long-term basis for deterrence.

Thus, the decision to initiate the SDI program was based on a sober, realistic assessment of the threat we face, and on our ability as a Nation to respond to the security challenges we now face and those we will face in the coming decades.

President Bush upon entering office called for a comprehensive review of our national security strategy and objectives. In doing so, he pressed us to "challenge assumptions" concerning previous national security policies and programs, including SDI. We did and, based on that review, have determined the following with respect to the SDI program:

- 1) The goals of SDI remain sound. In this regard, in pursuing SDI, we do not seek superiority, but to maintain the strategic balance and place deterrence on a more stable basis.
- 2) Pursuit of a robust SDI Program provides a hedge against any near-term Soviet decision to expand rapidly its anti-ballistic missile capability beyond that allowed by the ABM Treaty;
- 3) We will continue to aggressively pursue options for layered defenses composed of both space- and ground-based elements, recognizing that layered defenses offer substantial advantages in terms of defense effectiveness and imposing uncertainty on Soviet warplanners;
- 4) We will place emphasis on program flexibility and continue

toward deployment of a system that will meet the requirements of a Phase I Strategic Defense System (SDS), as those requirements have been defined by the Joint Chiefs of Staff, by focusing on evaluating the potential of the most rapidly advancing technologies such as Brilliant Pebbles.

5) The SDI program is to be conducted in full compliance with all U.S. international obligations, including the ABM Treaty; and

6) In recognition of fiscal constraints, we have reduced the budget request for Fiscal Year 1990 and later years (here, we must concede that the reduction in the SDI budget request for FY 90 and beyond may cause a slip in the date in which effective defenses could be deployed; on the other hand, technological advances may in fact allow the schedule to advance).

What does the President's decision say about the Administration's views on the scope and purpose of SDI? First, the President's decision takes into account SDI's long-term goal of developing, if feasible, defenses against ballistic missiles which would be so effective as to permit a major shift in our strategy from emphasizing the threat of retaliation to emphasizing direct denial of Soviet war aims and providing a true damage-limiting capability for the United States should deterrence fail.

Next, the President's decision recognizes that the national debate over the SDI program has tended to focus on the long-term prospect of a fundamental shift to defense dominance. In point of fact, however, the deployment of active defenses need not be viewed as a radical departure from current U.S. deterrence strategy. The United States already spends a great deal of money to protect elements of its strategic forces by passive means (e.g., mobility, Stealth, hardening). In addition to the capability to limit damage to the United States, for example, in event of an accidental launch of a small number of missiles, active defenses could be used in combination with these passive means to protect elements of our strategic deterrent.

Furthermore, one can envisage a U.S. offensive-oriented deterrent augmented by modest or moderate levels of defense, in

the early stages of defensive deployments, which could move us toward a new strategy of deterrence through direct denial (and of damage limitation, should deterrence fail) as the defenses become increasingly robust. Depending on their effectiveness, active defenses could also provide protection against differing levels of Soviet and third country attack.

In deciding in favor of pursuing options for layered defenses, the President recognized that such defenses would provide a significantly greater contribution to deterrence and defense than could be afforded by purely ground-based defenses. Used in a preferential, adaptive manner, layered defenses could provide increased protection for mobile missiles needing dispersal, and for a range of selected military targets (including ICBM silos, command, control and communications facilities, nuclear weapon storage sites, conventional military bases, force projection assets, and critical war-supporting facilities). Such defenses could also assist offensive forces in countering the growing threat posed by Soviet mobile/relocatable missiles. Mobile/-relocatable missiles that could not be successfully held at risk by U.S. strategic offensive forces could be engaged by the U.S. defensive system. In addition, by including both space- and ground-based elements, layered defenses would be more resilient than modest defenses to Soviet countermeasures. They would also provide a firm foundation for progressively more capable defensive deployments.

Furthermore, the President was cognizant of the fact that, although defenses of this level of effectiveness could not protect the entire U.S. population against a full-scale strike, they could provide meaningful population protection against ballistic missile attack in a limited conflict. The population would remain vulnerable to other forms of attack, however, notably bombers and cruise missiles until such time as effective air defenses were deployed.

It was recognized in addition that the Soviets may very well take steps to reduce the effectiveness of any U.S. defensive

deployments. We will consider, in our evaluation of options generated by SDI research, the degree to which certain types of defensive systems, by their nature, encourage an adversary to attempt to overwhelm them with additional offensive capability while other systems can discourage such a counter effort. We seek defensive options -- as with other military systems -- that are able to maintain capability more easily than countermeasures could be taken to try to defeat them.

Now I would like to turn to other policy matters related to SDI. We are encouraging participation in the SDI program by our allies. Since SDI began, we have negotiated and signed Memoranda of Understanding with five of our allies to facilitate their participation in the program. While such an MOU is helpful, it is not mandatory for participation, and organizations in countries that have not signed an MOU have successfully competed for contracts. This arrangement has helped our allies understand SDI much better and has made available to us additional technical expertise to help advance the research.

Also, the United States wishes to pave the way for a cooperative transition to a world in which effective defenses against ballistic missile attack play an increasing role in assuring deterrence. We are pursuing this objective with the Soviet Union in the Defense and Space Talks. In particular, we wish to build on the agreement concerning Defense and Space issues reached between President Reagan and General Secretary Gorbachev at the Washington Summit in December 1987. The heart of the agreement at the Summit was that the United States would agree to a specified period during which neither side would withdraw from the ABM Treaty in return for acknowledgement of our existing rights under the terms of the ABM Treaty to conduct research, development, and testing of certain ABM systems and the right to deploy defenses at the end of the non-withdrawal period without further reference to the ABM Treaty. This position supports fully the SDI program and U.S. national security objectives in that it protects our right to investigate defensive technologies, enables us to discuss

a cooperative transition with the Soviet Union, and redress the current asymmetry in the ability to deploy strategic defenses. In sum, then, in Defense and Space we seek an agreement which would help provide a stable, predictable basis for developing and testing advanced defenses against ballistic missiles, and for deployment of such defenses when they are ready.

In the Defense & Space Talks, the Soviets continue to try to lure us into agreements that would place restrictions on our existing freedom to conduct an energetic SDI program. We have rejected such proposals in the past, and for good reason. In fact, we cannot and must not close off promising avenues of technological research before they yield answers to the fundamental question: Can effective strategic defenses be proven feasible?

In conclusion, the President has taken a long, hard look at the SDI program and has determined that the goals remain valid. The changing nature of the threats we face and the emergence of promising technical concepts argue strongly in favor of continuing to pursue an aggressive SDI program. In addition, we must not succumb to Soviet pressures to constrain our research endeavors and allow them to maintain an edge in such a capability. The United States continues to have solid strategic and geopolitical interests in aggressively pursuing SDI, and we in the Administration urge your strong support for this vital, complex program. Thank you.

Senator EXON. Thank you very much, Mr. Ambassador.

I would like to ask at this time unanimous consent that the opening statement from Senator Thurmond be included in the record immediately following mine. Senator Thurmond asked. Back and forth with other obligations, setting up the time has raised havoc with his schedule. He will be back here.

Without objection, his statement is included.

Senator EXON. General, we welcome you. Please proceed.

**STATEMENT OF GEN. ROBERT T. HERRES, U.S. AIR FORCE, VICE
CHAIRMAN, JOINT CHIEFS OF STAFF**

General HERRES. Thank you very much, Mr. Chairman. I join the Secretary in thanking you for the opportunity to appear and address this issue.

I have a prepared statement which supplements that.

Senator EXON. Without objection, it is accepted.

General HERRES. Thank you very much. I would only like to summarize a few thoughts that are contained in that statement for you, in the interest of time.

I think that the Under Secretary's statement provides an excellent background on the evolution of today's strategy and our strategic posture, how we got to where we are today. My statement addresses principally the requirement, the military requirement, and addresses the problem from the military standpoint.

It is based on the concept of deterrence, which continues to be our strategy, and it is our belief that the Strategic Defense Initiative effort underpins that strategy of deterrence.

What it will do if it is successful is give us an opportunity to move toward a more balanced strategy, not totally dependent on offensive retaliation, to seek our goals. The JCS requirement for the Phase I system basically aims at three goals to limit damage, limit early damage of a major attack, and thus deny the opportunity and minimize the probability that such a major attack can achieve its goals. |

[Deleted] we think we have introduced a considerable amount of uncertainty in turn in the mind of the attack planner and therefore deterred attack.

Further, a second goal is that the Phase I system should [deleted]. What we had in mind here was the possibility that at some point in the future there might be third countries with capabilities that might be threatening and that we would wish to be able to defeat.

And the third objective is to [deleted].

Our concept for the deployment of the SDI system is an incremental deployment. A Phase I system is the minimum level of capability that we feel can make a significant contribution to deterrence, creating the uncertainties I discussed at sufficient levels so as to dissuade attack.

Among the requirements of the ballistic missile defense system are the need for an attack warning system and a system that can verify attack in a manner that facilitates having a man in the loop. And we had in mind, of course, the Commander in Chief of Space Command, who has that responsibility.

[Deleted.]

We continue to review requirements as the threat changes. Our first model for this attack is a representative model, not the only threat that we would expect to have to deal with, but as a model that is representative of the possibilities of threats, consisting of [deleted].

That was designed for an earlier time period, [deleted].

Again, I emphasize that the Phase I system is not a complete ballistic missile defense system. It is a first step, it is a first meaningful step toward such a system. It has to be built upon and it has to be supplemented by other capabilities.

And of course, an offensive, a robust offensive capability is the other part of this equation in order to continue to provide deterrence.

Systems must be effective, they must be reliable and affordable. It is important, as I point out in the statement, not to be rushed to deploy unproved systems which cost too much money. And we sup-

port General Monahan's deliberate approach to investigating new technologies as we move toward the decisions that will have to be made downstream with regard to deploying such an important system as we contemplate.

In conclusion, then, our requirement is unchanged since I last met with you and since I last testified before the Senate Armed Services Committee. If the requirements can be met and are met, they will significantly stress Soviet war plans.

In my view, they will make a preemptive attack most unattractive. They represent the minimum capability necessary to enhance deterrence, and they are the first step toward a more comprehensive system.

This is the extent of my summary of the prepared statement, Mr. Chairman. We are available for questioning.

[The prepared statement of General Herres follows:]

PREPARED STATEMENT OF GEN. ROBERT HERRES, VICE CHAIRMAN, JOINT CHIEFS OF STAFF

Thank you, Mr. Chairman for the opportunity to appear before your subcommittee today and discuss operational requirements for the ballistic missile defense system. In March of 1988 I testified before your subcommittee in closed session and discussed the operational requirements the Joint Chiefs of Staff had identified for the first phase of a ballistic missile defense system. These requirements remain unchanged. The United States continues to adhere to the concept of deterrence and, should deterrence fail, to having the ability to deny the enemy accomplishment of his war aims. We must continue to support efforts that lead to an effective defense that will protect the United States and its allies from the threat of attack by ballistic missiles. Ballistic missile defense can enable the United States to fundamentally change its strategic assumptions regarding deterrence and permit a shift of emphasis from strictly offensive to a balanced offensive and defensive orientation. Effective defenses against ballistic missiles could significantly increase Soviet uncertainties regarding a given ballistic missile weapon's ability to penetrate and destroy U.S. and allied targets. Difficulties in predicting vulnerability and outcome could make Soviet military planners much less likely to contemplate initiating a ballistic missile attack, even in crisis circumstances. To move toward this objective, it is clear that a strategic defense system will have to be deployed incrementally over time. The basic requirement for the first phase is to be capable, in combination with our strategic offensive forces, of creating sufficient uncertainty in the Soviet war-planner's mind to dissuade him from attack. The requirements for Phase I would do this, and represent the minimum level of capability the Joint Chiefs of Staff consider necessary for a meaningful contribution to deterrence.

I stated the specific requirements for the Phase I portion of the strategic defense system in my last testimony to you. The requirements are classified SECRET and have not been modified in the interim.

[Deleted.]

Lesser capabilities are likely to not deter a major, coordinated Soviet attack, though much more limited third world attacks are inadvertent or unauthorized attacks might be defeated with a system of lesser capability, i.e., the smaller the attack, the greater the damage limitation effect. The JCS is continually reviewing the requirements in light of the changing threat, and changes to the requirements will be made when and if they become necessary.

It is important to recognize that this first phase should not be considered a complete ballistic missile defense system. Planning, research, evaluation, and testing for subsequent phases must lead to an evolving multiphase system that incrementally builds upon the first phase to achieve sufficient defense effectiveness and robustness to discourage proliferation of the Soviet threat and introduction of countermeasures. Just as one component of our offensive forces—such as land-based ballistic missiles, manned bombers, or submarine-based ballistic missiles—should not be expected to carry the entire defensive load. Fiscal and technical constraints as well as future changes to the threat will, of course, affect the timing and pace of deployment. Care must be taken to ensure that technology supports systems that we can have confidence will be both effective and affordable. We cannot afford to rush into deployment of unproven systems before they are mature—the costs are too high. I support

the prudent, deliberate course of action Lt Gen Monahan is taking to investigate new technologies.

Finally, it must be emphasized that DOD regulations require the Strategic Defense Initiative Organization's programs to be thoroughly evaluated for compliance by the DOD Compliance Review Group and to be conducted in strict compliance with our national policy in regard to the ABM Treaty.

In conclusion, the Joint Chiefs of Staff have not modified the operational requirements for the Phase I strategic defense system. The requirements, if met by the first phase of a future defense system, will significantly stress the viability and integrity of Soviet strategic war plans. [Deleted.] Finally, we believe that Phase I is only a first step towards a comprehensive system which should be deployed when it is technically feasible and fiscally prudent to do so.

Senator EXON. Gentlemen, thank you very much. We will launch into our questions to conserve time.

SDI ORGANIZATION REPORT

Let me ask these questions of you, Mr. Secretary. Appendix C of the 1989 Strategic Defense Initiative Organization report which was submitted to the Congress by Secretary Carlucci on January 19th, 1989, contains the following statement:

"Currently, no experiment has been approved which would not fall within the categories used in Appendix D to the 1987 report to the Congress on SDI."

Mr. Secretary, can you confirm for the subcommittee that this statement means that there are no SDI development or testing activities planned for fiscal year 1990, including long-lead acquisition in fiscal year 1990, of material or equipment uniquely required for such development or testing in later years, which would conflict with the agreement on the ABM compliance issue with the Congress worked out with then National Security Advisor Frank Carlucci in 1987, as reflected in section 225 of Public Law 100-180?

Ambassador WOLFOWITZ. The short answer to that, Senator, is yes. As I understand it, as a matter of fact the SDI program we are proposing for fiscal year 1990 includes no experiments or tests in fiscal year 1990 that would go beyond what is called the restrictive interpretation of the ABM Treaty, nor does it include funds to purchase equipment in fiscal year 1990 that would be uniquely required in later years for such experiments or tests. And should our plans in this regard change, we would consult with the Congress and request your approval through normal budgetary procedures.

And I would ask General Monahan, who knows the program, if that is a correct statement of fact.

General MONAHAN. That is a very correct statement.

Senator EXON. Thank you.

SDI EXPERIMENTS

Can you also confirm that none of the SDI experiments which require additional compliance review will entail development or testing in fiscal year 1990 or the purchase in fiscal year 1990 of material or equipment uniquely required for development or testing in later years that would conflict with the 1987 agreement, as reflected in section 225, Public Law 100-180?

Ambassador WOLFOWITZ. My understanding, Senator, is that that is also correct. And I would ask General Monahan.

General MONAHAN. That is also correct, Senator.

Senator EXON. Finally, one question on the subject of compliance with the ABM Treaty. Is the 1985 Presidential Directive requiring that the SDI program be conducted according to the so-called "restrictive interpretation" still in effect?

Ambassador WOLFOWITZ. Mr. Chairman, I think we are continuing to pursue what is the soundest technical SDI program. If and when that involves tests or experiments that would require the broad interpretation, as opposed to the restrictive interpretation, we would consult with the Congress and seek approval for such tests or experiments through normal budgetary procedures.

Senator EXON. Well, it is a pretty direct question, Mr. Ambassador. Let me read it to you again. Is the 1985 Presidential Directive requiring that the SDI program be conducted according to the so-called "restrictive interpretation" still in effect?

General MONAHAN. Yes, it is still in effect.

Ambassador WOLFOWITZ. Yes, it is still in effect.

Senator EXON. Thank you.

My time is up. Senator Thurmond.

Senator THURMOND. Thank you, Mr. Chairman.

Ambassador Wolfowitz, President Bush has stated that during his time in office he will not leave the United States undefended and that he will deploy defenses when they are technically feasible. When does the administration expect to make a decision regarding whether or not to deploy strategic defenses?

Ambassador WOLFOWITZ. I think on the current program, Senator, we would expect to be able to make a decision about full-scale development, which is not quite the same as a deployment decision but implies a deployment decision, in roughly the [deleted] time frame.

Is that correct, General Monahan?

General MONAHAN. You make a decision, and the funding may not support initiating a full-scale development rate at that time. But we should be——

Senator THURMOND. I cannot hear you.

General MONAHAN. We should be prepared to make a full-scale development decision in about [deleted] time frame, Senator.

Now, funding may not allow us to go ahead with all full-scale development activities until perhaps fiscal year [deleted]. But we should have the technical work done to support the decision in about [deleted].

Ambassador WOLFOWITZ. It depends, Senator, partly on the success of the technological development. If Brilliant Pebbles proves to be very effective, then we would be closer to the [deleted] end of it. If it proves not to work and we have to go to, I call it, more conventional technologies, then we are more in the [deleted] direction.

BSTS SYSTEM

Senator THURMOND. General Herres, have the requirements for the development of the BSTS system changed regarding the tactical warning and attack assessment mission of the system?

General HERRES. In effect they have not changed in any substantial way, Senator. The requirements have evolved over the last several years and they have been expressed in a variety of forms.

The latest version is a mission needs statement which is being developed by U.S. Space Command at the present time. In fact, it is pretty well finalized. And a comparison of those requirements shows that there is no significant difference amongst the individual capabilities called for.

However, there are some differences, and the requirement has evolved somewhat as we have learned more about how we would like to express the capabilities of a new system. [Deleted.]

So the requirement has evolved. The basic capabilities are, for all practical purposes, the same.

Senator THURMOND. I think my time is about up, Mr. Chairman.

Senator EXON. Thank you very much.

Senator Bingaman I believe is next.

Senator BINGAMAN. Thank you, Mr. Chairman.

Mr. Secretary, I guess I am concerned about the priorities as I understand them. Maybe you can clarify for me.

SDI PRIORITIES

The administration's priorities in the SDI program—the directed energy portion of the SDI program has consistently decreased in recent years. In 1986 it represented 29.3 percent of your SDI budget. Now it represents 18 percent of your SDI budget.

I am particularly concerned about a letter that Secretary Cheney wrote to Bob Michel that appeared in the Congressional Record on the 24th of May, where he basically makes the point there that, if funding is cut to the range of about \$4 billion, which is a not totally unlikely possibility, given the present thinking in Congress, but if funding were cut to that level, he said major experiments with large sunk costs would be terminated—free electron laser, Starlab, neutral particle beam, chemical laser. He's got "and/or chemical laser."

And I guess what concerns me is, it seems to say to me that, given that kind of funding level, the priority for this goes to zero for these directed energy weapons research parts of the SDI budget, and the near-term technology, the Brilliant Pebbles program, and other Phase I activities would then be the sole activity pursued by SDI. Am I misreading that letter?

Ambassador WOLFOWITZ. Let me ask General Monahan, who has got all the program details, to answer that.

General MONAHAN. Okay. First of all, Senator, the amount of reduction that was being addressed there was very, very severe.

Senator BINGAMAN. I think \$4 billion was the range, was it not?

General MONAHAN. I think it was down about \$3.5 billion. It was \$900 million less than what is in the President's budget request, as I recall.

Senator BINGAMAN. I think maybe that was the DOD portion, plus the DOE.

General MONAHAN. Perhaps so.

But at any rate, with a reduction of that magnitude, we are going to have to really have some guidance and really look at priorities of where we take the cuts. Now, whether or not we take them on directed energy and maintain more of the Phase I, the infrastructure type systems, or not do as much work on the infra-

structure and the Phase I system and concentrate more on the directed energy, that is something we would have to work out.

I believe what you saw there were notional things that might have to go if we had to take cuts of that magnitude. Whether or not we take them hard in the directed energy arena or in the kinetic energy arena is going to be determined again by what kind of direction and guidance we might see.

Senator BINGAMAN. So where he says "major experiments in these areas would be terminated and near-term technology would be maintained," we are to take that as a notional idea?

General MONAHAN. I believe so, that is correct.

Senator BINGAMAN. That is not a policy that the administration has decided?

General MONAHAN. I am not aware that that is a policy that has been decided, that is correct. There would be ample opportunity to take a good hard look at just exactly where we would go.

Senator BINGAMAN. Well, let me ask these two witnesses. I think these two witnesses would make that decision. Maybe they can tell us how they would decide that. If we came out at about \$4 billion combined DOD-DOE funding on SDI, do you consider those directed energy programs significant enough to continue to pursue, or would that kind of major cut force you to terminate?

Ambassador WOLFOWITZ. Senator, I think if we took cuts like that all parts of the program would suffer. There are elements in here that are of critical importance, including not only for SDI, but also for the development of our strategic warning and surveillance system. A cut of that magnitude is just going to hurt across the board in my opinion.

Senator BINGAMAN. Well, I understand it hurts across the board. What I am concerned about here is the statement which I understand the Secretary to be making in that letter to Mr. Michel, which was that we would terminate the directed energy programs, the research on those programs, and we would maintain the Phase I activity.

And that is not consistent with my view of where our priorities should be, and I would just be interested in knowing if it is consistent with yours.

Ambassador WOLFOWITZ. I certainly do not think we would be talking about terminating the directed energy program. I do not have the letter in front of me, Senator. You read the language. It talked about terminating "major experiments." I think "major experiments" would go. You cannot keep the whole program.

But we have not tried to apportion precisely a \$900 million cut. We really hope we do not have to do that, because it is going to cut everything.

Senator BINGAMAN. How much do you anticipate Brilliant Pebbles would cost in the budget you are proposing, the research leading to the Brilliant Pebbles activity?

Ambassador WOLFOWITZ. General Monahan?

General MONAHAN. Senator, we are doing an in-depth cost estimate of Brilliant Pebbles at this time. I am going to cover this a little bit later in my presentation, but I will just make a few remarks now. And that effort is underway this summer.

I think it is premature to try to give any figures in which we could have a lot of confidence as to what the development costs of Brilliant Pebbles might be. Certainly I cannot conceive that they would be as high as the costs associated with conventional Space-Based Interceptors. But as of this time, until we get that very important work done, I think it is very difficult to say.

Senator BINGAMAN. My time is up, Mr. Chairman. I will have some more questions along this line when I come back for the next round.

Senator EXON. Thank you, Senator Bingaman.

Senator Wallop.

Senator WALLOP. Thank you, Mr. Chairman.

Mr. Secretary, General Herres, one thing I hear pretty clear is an echo of what Secretary Cheney said to all of us when he came and presented the budget, that he cannot give us more defense with less dollars. And I am also hearing in your responses, which I accept but am disappointed in, not in you, but in what the Congress has done to constrain the country which we all seek to serve, but in answer to the Chairman's question you basically said that we have so confined SDI according to treaty interpretations imposed by the Congress that we probably cannot get to a full-scale development decision without going to some of the crossroads which you, Mr. Ambassador, spoke of.

I note with some interest in the next to the last page of your statement on page 10 you said: "In addition, we must not succumb to Soviet pressures to constrain our research endeavors and allow them"—and the words that are most chilling to me is—"to maintain an edge in such capability."

Now, there is apparently—and I just direct this to both General Herres and Secretary Wolfowitz. There is apparently [deleted] there are just as persistent reports, another just the other day in the New York Times, that the Joint Chiefs continue to counsel the President that, because the Soviet Union is poised to break out of the treaty, we should not move forward with our own BMD deployments at this time.

I am struck by the irony that, [deleted] the policy conclusion seems to be the same. It is hard for me to understand which is the case, and if I could get either of you to describe which is the case I would have a follow-on question.

General HERRES. I can address part of your question, Senator. [Deleted.]

It is based simply on the concept that I briefly alluded to earlier. That is, if one can introduce a significantly greater amount of uncertainty in the mind of the Soviet planner with regard to the success of his attack, you can add to deterrence without adding to offensive capability and without adding more threat of retaliation, which seems to be, unconstrained, the only other alternative.

[Deleted.]

Senator WALLOP. Well, but from a strategy sense some of us have argued from the beginning that it adds to stability by increasing doubt and deterrence. But I was in President Reagan's office, the Oval Office, one day just after he had spoken, and he quoted directly from the Joint Chiefs' statement.

[Deleted.]

And then, this February, the other conclusion has been repeated in all kinds of areas. I was sort of trying to find out, A, which conclusion—which is the CIA's or the DIA's assessment?

General HERRES. With respect to the second point you made, which is a good one, I would like to clarify that just a little bit. You said it fairly well, except that the concern was and still is that, [deleted].

However, there are other problems that the Soviets would experience, and I think that the [deleted].

And it appeared to us, and based on the intelligence estimates we were getting at the time, that [deleted].

Senator WALLOP. Mr. Chairman, my time is up. Thank you.

Senator EXON. Thank you, Mr. Wallop.

Senator Glenn.

Senator GLENN. Thank you, Mr. Chairman.

R&D

I have supported the R&D. I have been opposed to early deployment for the last couple of years. I have supported, fervently supported, all the R&D. But it has become more difficult, gentlemen, to be quite honest about it.

We have gone from the Astrodome defense, which was the original concept. We then went to SDI Phase I, a space-based interceptor. Then we went to—now we are off on Brilliant Pebbles.

Is it impossible to define the program any more carefully than we have been doing? It just seems constantly shifting, and I frankly do not know what to support and what not to support on it at this point. I do not know what our budgetary or strategic priorities are right now.

We have a lot of people conceding that an Astrodome defense over the United States is extremely difficult, if not impossible. We still have to get our directed energy weapons out there, and the scientists in the lab tell us those are 10, maybe even 15 years away from even having the option of deciding where to go.

And so we wind up with all the extra costs and shifting from one program to the other. Many SDI proponents are advocating a partial defense to protect the land-based strategic missiles, and so that is another one. And if the goal of SDI then becomes optimizing the survivability of our land-based systems, would it not be less expensive and far more stabilizing from an arms control standpoint to go with the most survivable land-based missile we have, and that is the Midgetman?

Now, where does all this leave us? We have shifted three times now from one program to another over a very few years, and in the meantime we start deploying or trying to push for deployment in one particular area. And General Abrahamson used to tell us at the early end of the program it did not pay to go with any of this unless we really saw that we could put together the lasers, the particle beams, and the computer technology, to put the whole thing together; but it did not pay to go with any of it.

Then we went to sort of a limited deployment. Well, that was supposed to do something. Then we shifted. Can you sort all of this out for me?

Ambassador WOLFOWITZ. Senator, it seems to me that the key to this is——

MOBILES

Senator GLENN. Why do we not just go to mobiles and then they cannot hit us and we have a reliable land-based deterrent to complement our sea-based ICBMs?

Ambassador WOLFOWITZ. Right, and you have solved one particular problem with the ICBMs. But I think you said at the beginning that the goal of this is research and development, so that we know more clearly what our options are, not a full-scale deployment.

We do not even expect a full-scale development decision——

Senator NUNN. I did not hear that.

Ambassador WOLFOWITZ. Not a full-scale deployment. We do not expect a full-scale development decision until [deleted].

Senator GLENN. Full-scale, I agree. But we were going with the limited.

Ambassador WOLFOWITZ. Brilliant Pebbles is not a shifting rationale. It is an example, precisely the kind of thing that can happen with a vigorous research and development program, if you come up with ideas and new technology that allow you to do things with an effectiveness and an economy that you did not know you could do previously.

Senator GLENN. Is this in addition to space-based interceptors? Is this in addition to Phase I as we used to define it?

Ambassador WOLFOWITZ. If it proved out effective, I believe it would probably be an alternative to the space-based interceptor. We do not know yet whether it will prove out effective, but it would substitute for a large number of expensive pieces in what has been, up until now, considered the optimum architecture.

So as we proceed with this research and development, we discover new possibilities and new options, and that is part of defining what it is in the end we want to try to do.

If I might go back to Senator Wallop's line of questions, it is also part of making sure that we remain in the driver's seat and that we are able not to have to constantly worry that the Soviets will break out, but to be able to negotiate with them on the direction we want to see things go, because we have the greater range of options.

EVERYDAY WEAPONS RESEARCH

Senator GLENN. Well, have we taken money away from any of the directed energy weapons research to do some of these other projects? Those are the ones I thought really had some promise for the future and applications in many different military ways, not just in SDI. Have we taken money away from those programs, the DEW programs?

General HERRES. I would like to explore or follow up the Secretary's comments, Senator Glenn, on this, and then I think that the full answer to the latter question can best be addressed by General Monahan.

But I think it is important to point out that the phase that SDI has been in, the development phase that it has been in up until

now, has been the concept exploration phase. And the nature of the business is to explore a wide variety of concepts, and what may appear to be bouncing around from one program to another, as an unwise thing to do, which it would be if we were passed full-scale development of the program, is exactly what one wants to do during concept exploration.

And so you have seen lots of different ideas in concept exploration. It is a time for the competition of ideas to see which is really going to be the best and most effective way of dealing with this challenge.

Senator GLENN. Are we planning any proposal to really start putting anything out there, a limited deployment of one kind or another in this new budget?

General HERRES. No, sir. The work that is funded is continued concept exploration. The only program that moves ahead is the program that we would need whether or not there is a full-scale development decision made with regard to other components, the anti-ballistic missile components.

Senator GLENN. Are you going to go ahead with—

General HERRES. In other words, the surveillance and tracking system.

Senator GLENN. Do you go ahead with that kind of technology until you know that we have a breakthrough in the directed energy weapons? Senator Bingaman pointed out here that over the years we have gone from 29.8 down to 18 percent of the budget. Now, I know during that time period the budget got up a little bit, so maybe the dollars have not changed that much.

But that is an 11, almost 12, percent reduction in the percentage of the total budget.

Ambassador WOLFOWITZ. Senator, there is one element in the budget that General Herres was referring to that we will want even if we do absolutely nothing with SDI, and that is the Boost Surveillance and Tracking System that would be part of our surveillance and warning system.

That is the only development item in the budget—

Senator GLENN. We are going to point defense now, which is one of the concepts I guess we are looking at. We are going to point defense. Why do we not get a better buy by going to Midgetman rather than that? Because then we can deploy wherever we want to go. We are not limited to railroads. We are not limited to, as we still will be if we go to point defense, to things still sitting in silos.

General HERRES. There are things that a strategic defense system can do as it makes its contribution to deterrence that an offensive ballistic missile system cannot do.

For example, in a multipolar world, when there are other threats, threats other than the Soviet Union, deterrence may not be the best strategy or it may not be the only strategy that we will have to depend upon, particularly if there are threats that are unknown until they are actually launched.

Retaliation, the threat of retaliation, may be an unwise strategy. So the capability to deal with limited attacks from other threats is an important capability for this country to have at some point in the future. The point is that a defensive system can, without

having to depend on retaliation, offer a contribution to deterrence and accomplish other things as well.

Furthermore, the defensive system concept that we propose and would pursue can introduce the kind of uncertainty that I talked about earlier by suggesting to a hostile planner that such elements of his attack as the decapitating element may not be successful. And with a very modest capability to increase that uncertainty, the necessity for him to execute a decapitating strike in order to successfully carry out a preemptive attack is taken away.

Now, offensive retaliation can do only one thing, and that is threaten an unacceptable response. What the strategic defense system can do is complement that capability without adding to our offensive capability.

Senator GLENN. Well, okay, I may want to get back to that later. Thank you. My time is up.

Senator EXON. Thank you, Senator Glenn.

Before I recognize Senator Wilson, I just want to caution you all that we have six Senators who have not had their first round yet. We are trying to give everybody 5 minutes. I appreciate everybody sticking to the time limit. They have so far.

For those who were not here to begin, this panel must leave by 2:45. So without further ado, Senator Wilson.

Senator WILSON. Thank you, Mr. Chairman. I appreciate that.

Senator EXON. I was not pointing at you. I just wanted to state it for the record.

PHASE I OF SDI

Senator WILSON. Well, in light of your admonition or otherwise, I note that in the secret text the statement is made that Phase I would achieve the requirements that the Joint Chiefs have recommended for strategic defense. And then it is stated that they also represent [deleted].

I think that statement speaks for itself. Let me pick up on Senator Glenn's comments. You mentioned point defense. We are talking now about in the first phase a system that would give a very substantial footprint, are we not, so that we are not talking about simply point defense in terms of defending fixed silos in North Dakota or Wyoming? We are talking about something much wider?

Yes, sir?

General HERRES. Yes, sir, absolutely.

Senator WILSON. Is it not also true that, if you perceive, as I do, that we are very differently situated from the Soviets in terms of our ability to take advantage of something like Midgetman, they having a virtual continent, 11 time zones wide or 13, whatever it is, heavily wooded, full of opportunity for concealment, it seems to me virtually assured that they will move probably increasingly to a mobile, road-mobile missile, in addition to the rail-mobile capability?

Does that not argue compellingly for the kind of BMD deployment without which we really are very much at risk, given the difficulty we have, with whatever advantage there may be, in targeting those mobile targets of theirs?

General HERRES. Yes, sir.

Senator WILSON. It seems to me it makes a compelling argument for BMD.

General HERRES. Senator—I agree. Another way of putting that is if the adversary can achieve total location uncertainty in the deployment of a system, then the only way you can hold those warheads at risk is to attack them after they have been launched.

Senator WILSON. Even if there are no ground-launched capabilities, let us just assume that they were achieving mobility and concealment to achieve survivability by total reliance on submarine-launched; would not their submarine-launched capability alone argue compellingly for BMD?

General HERRES. Yes, sir, probably less so than in your first example. I personally do not regard submarines as quite the same threat as a land-based missile with respect to preemptive attack. But it is certainly the same circumstance. It is total location uncertainty, whether on sea or on land; you cannot get to that warhead until after it is launched.

The only difference between the two is that if you had total dependence on submarines, I think it is less threatening.

Senator WILSON. But in combination?

General HERRES. In combination, absolutely, or even in both cases, either case. It is just a matter of degree.

ABM COMPLIABILITY

Senator WILSON. That being true, let us pursue the point about ABM compliability or rather, our compliance with it. You were asked a question by the chairman as to whether or not we continue in accordance with the President's 1985 restrictions.

The answer was yes. Ambassador Wolfowitz, I think with candor and accuracy, said that there is going to come a time, we assume, when we will bump up against the constraints of the treaty. And at that point, he said, they would likely, if they thought those to be profitable avenues to pursue, come to the Congress seeking authority to do so.

How far away are we from that in your judgment? Perhaps General Monahan would like to answer. I do not know.

General MONAHAN. In my view, Senator, we would first run into the restrictive interpretation of the treaty some time when we are in [deleted].

Senator WILSON. One of the stated requirements of this first phase system is that the ground-launched element of it be capable of expending totally the space-based portion, if I understand correctly the statement that was made. Would that be the portion that would run up against the treaty?

General MONAHAN. I am not sure I understand the question. The ground-based system, 100 interceptors——

Senator WILSON. General, this has to do with the statement. I will ask General Herres actually. It is his statement, the secret statement, on page 4. You state: [deleted].

General HERRES. Yes, sir, and the idea of course is that the kill ratios that I discussed earlier have to be achievable [deleted].

Senator WILSON. Now, my question to you is, in order to achieve that requirement that [deleted] you are going to have to engage in

some kind of testing. You are going to have to know certain things that you cannot gain in any other way.

Will that kind of testing and necessarily some deployment just to run the tests, is that going to result in your judgment, in your interpretation, in bumping up against the constraints of the narrow interpretation of the ABM Treaty?

General HERRES. This particular testing along these lines—and one can only speculate, because one has to know how things are going to unfold or further develop—is probably less likely to do that than in other areas.

Senator WILSON. This Brilliant Pebbles?

General HERRES. Really what we have got here is more a question of timing and so forth and how you deploy, and deployment concepts have as much to do with whether or not this requirement can be met in this fashion as the individual capabilities of the systems as manifested by the tests.

Senator WILSON. Mr. Chairman, I would hope that in this closed session General Herres and General Monahan indicate to us with as much specificity as they can where the first phase bumps up against those constraints.

General HERRES. General Monahan could best address that when he gives his statement.

General MONAHAN. When I give my presentation, I would be happy to talk about that in more detail, Senator.

Ambassador WOLFOWITZ. I might just say, Senator, there is a point out there somewhere, if you go to full-scale development, as General Monahan said, [deleted] where it is almost impossible to conceive of how you proceed without going beyond not only the restrictive interpretation, but probably the broad interpretation as well.

The testing program we have right now fits within both of those. As you go further along, you may get to a point where you can do 99 percent of what you want to do within the restrictive interpretation. Maybe you can even do 100 percent if you put a little extra money into it somewhere.

But you start at some point in the mid time frame to start to impose some restrictions on the program. General Monahan can speak to that in more detail. But obviously that is something we would be tracking very closely, and we will consult with you very closely about it.

Senator WILSON. Thank you, gentleman.

Thank you, Mr. Chairman.

Senator EXON. Thank you very much, Senator Wilson.

Senator GORE.

Senator GORE. Thank you very much, Mr. Chairman.

Mr. Wolfowitz, I interrupted your statement, perhaps with a bit of sarcasm, in reference to your description of the summit statement because I detect in recent days a tendency in the administration to develop what I would call a big myth about the importance and significance and meaning of the Washington summit, of the summit statement.

WASHINGTON SUMMIT STATEMENT

Just in an effort to try to put this to rest, because I truly believe it to be utter nonsense, President Reagan, former President Reagan, at the time, General Secretary Gorbachev at the time, and General Colin Powell 2 weeks later, all three said that your interpretation is not the interpretation that any of the three of them had of that statement.

Let me just read you, first of all, General Powell. I am quoting from the New York Times of December 30, 1987. "Powell in letter says Soviets reserve the right to scrap the treaty over dispute. President Reagan's National Security Advisor made it clear in a letter distributed today that the Soviet Union had reserved the right to abandon a proposed arms reduction report if the United States tested Star Wars components in space. General Powell's account"—and it goes on.

I am sure you are familiar with this letter.

December 5—Washington Times, December 15, 1987, quoting Gorbachev:

Certain persons even try to assert that the talks in Washington have removed differences on such a problem as SDI, and under that pretext may call for speeding up work on that program. I must say outright that these are dangerous tendencies and that they should not be underestimated. They can undermine the process of the demilitarization of international relations.

The following day, Washington Post, December 16, 1987, President Reagan says: "We are in disagreement" over these issues. "Yesterday Reagan conceded that the two leaders remain in disagreement and said: 'It was a simple thing. He took his position, we took ours, and it was put that way in the joint communique. We are going forward.'"

"Asked if that meant the leaders agreed to disagree, Reagan said 'Yes.'"

So the assertion in your testimony here that we got this grand agreement that removed this point from the table is just—you know, it is not in tune with reality in my opinion.

I have some other questions, but I want to afford you an opportunity to respond.

Ambassador WOLFOWITZ. Senator, obviously we continued to disagree on a great deal about SDI after that Washington summit. The basic point is that we did not disagree about everything. We worked out some language. We negotiated very hard over that language, and there are some critical elements in that language that seem to have clearly implied the kind of position we are going in with in particular.

I would be glad to submit for the record the language of the joint statement. The critical language that was agreed upon says that we would observe the ABM Treaty as signed in 1972—the Soviets specifically tried to get it to say "as signed and ratified," to imply the narrow interpretation, and they finally agreed to "as signed"—"while conducting the research, development, and testing as required which are permitted by the ABM Treaty"—which has been our language for broad interpretation, and the Soviets knew it and tried to get it out, but then agreed.

And the concluding language is that "each side will be free to decide its course of action." In the conversation between Secretary Carlucci and Foreign Minister Shevardnadze, it was agreed that that language, "decide its course of action," meant the freedom to deploy. And whichever Soviet general was there took some umbrage at that.

[The information follows:]

JOINT UNITED STATES-SOVIET SUMMIT STATEMENT DECEMBER 10, 1987

Taking into account the preparation of the Treaty on Strategic Offensive Arms, the leaders of the two countries also instructed their delegations in Geneva to work out an agreement that would commit the sides to observe the ABM Treaty, as signed in 1972, while conducting their research, development, and testing as required, which are permitted by the ABM Treaty, and not to withdraw from the ABM Treaty, for a specified period of time. Intensive discussions of strategic stability shall begin not later than 3 years before the end of the specified period, after which, in the event the sides have not agreed otherwise, each side will be free to decide its course of action. Such an agreement must have the same legal status as the treaty on Strategic Offensive Arms, the ABM Treaty, and other similar, legally binding agreements. This agreement will be recorded in a mutually satisfactory manner. Therefore, they direct their delegations to address these issues on a priority basis.

The sides shall discuss ways to ensure predictability in the development of the U.S.-Soviet strategic relationship under conditions of strategic stability, to reduce the risk of nuclear war.

Ambassador WOLFOWITZ. Now, with that and 75 cents you can get a cup of coffee. The Soviets can go back on anything that was agreed, and particularly something that was very vaguely agreed. But I would submit that having bargained hard to get this language and having bargained against the Soviets' clear effort not to have these things in it because of what they meant, we ought to try, as I said in the statement, to build on that agreement toward our negotiating objectives.

It is not worth a great deal, but it is worth something, and we should not scrap it.

Senator GORE. Well, I do not think it is worth a thing. In fact, I think it has negative worth, because the more time we spend attempting to assert what I believe is a patently ridiculous and tortured reading of a statement that has been publicly interpreted exactly to the contrary by the leaders of both nations who negotiated it—

Ambassador WOLFOWITZ. Senator, the statements you are quoting—

Senator GORE [continuing]. And by the National Security Adviser, who was in the middle of a dispute on this very point—after all, there was an effort at that time to come up with the tortured reading that the administration is now trying to provide, and it resulted in a little flurry and an exchange, where Gorbachev right away said: Hey, this is really dumb; if you try to do this, we are going to call you on it, because that has nothing to do with what we agreed on.

And the very next day the President of the United States says: Well, Gorbachev is right about that. And then 2 weeks later Colin Powell was forced to give out a public letter saying: Yes, Gorbachev was right about that; we abandon this tortured effort to try to take a comma and turn it into a substitute anti-ballistic missile treaty.

I mean, you know, I just think that you are entitled to your opinion, but it exposes any position that we adopt in the START talks that is in any way based on this kind of logic, I think exposes the country's position to ridicule. And I would just urge you not to waste a lot of time on it.

Now, on the question of doing SDI as a defense against the decapitation threat, the existing ABM Treaty would allow us to seek a change from Grand Forks in the United States and ring the Beltway with missiles. We are not interested in doing that.

But if that were the logic for an SDI system, there would be an alternative way of approaching it under the existing treaty. Where a third country threat or a terrorist threat is involved, if the weapon of choice were a cruise missile or an airplane or if they chose to smuggle the weapon into the country hidden in bales of marijuana, they would be able to evade any kind of system that was intended to defend against a terrorist threat.

And I think that, while this rationale is worthy of discussion, it seems to me that the idea of destroying the ABM Treaty, confronting the Soviet Union with a completely new strategic reality that would almost certainly result in them going forward in order to deal with this, it seems to me is a very bad rationale for this.

In any event, I had other questions, but my time has expired. Thank you, Mr. Chairman.

General HERRES. Mr. Chairman, I would like to respond to those last observations for the record.

[The information follows:]

It is true that Phase I of the Strategic Defense System will not deter a terrorist who uses an airplane, cruise missile, or bale of marijuana to deliver a nuclear weapon. It is doubtful if any system or combination of systems could deter a dedicated terrorist. What I was referring to was a new set of capabilities that defense offers and which added offensive systems cannot. I am concerned with ICBM and nuclear proliferation. After an irrational individual launches a missile containing a nuclear or chemical warhead, no amount of U.S. offensive capability can thwart the attack—only defenses can do that. While defending against terrorist attack is not the prime objective of Phase I, it is an important collateral mission.

Senator GORE. Yes.

General HERRES. To save the time.

Senator EXON. Please be brief. There will be a chance to answer for the record, but please go ahead.

General HERRES. That comment was taken out of context. First of all, I did not have in mind dealing with terrorist threats. Missile proliferation is a problem. We are concerned about it.

Senator GORE. Yes, I agree.

General HERRES. We are also concerned about nuclear proliferation.

Senator GORE. I agree.

General HERRES. We are concerned about the eventual convergence of those two technologies, and one has to be worried about whether or not that is inevitable and we would be left defenseless.

Deterrence may not work as well. What I was trying to describe is the contribution to deterrence that a strategic defense system can make that an offensive system cannot. So while there are some grounds for comparisons between a Small ICBM deployment and expenditures on that, investments there and a strategic defense system, there are some differences.

There are some things a defensive system can do for you that we regard as very important, that the offensive system cannot do.

Senator EXON. Thank you, Senator Gore.

Senator COHEN.

Senator COHEN. Mr. Chairman, there are milestones reached in this committee all the time. It is the first time I have heard the Senator from Tennessee cite the Washington Times as an authoritative source. [Laughter.]

Senator GORE. On Gorbachev.

BRILLIANT PEBBLES

Senator COHEN. There is a March 1989 report from Lawrence Livermore Lab on Brilliant Pebbles, and it indicates that the [deleted].

General Herres, could you tell us whether that is realistic in cost, schedule, and capability?

General HERRES. Well, I will answer, but General Monahan is probably in a much better position to answer that, I think.

[Deleted.]

Senator NUNN. I cannot hear you, General.

General HERRES. [Deleted.] That is just my personal view, but I suggest you follow that up with General Monahan.

Senator EXON. General?

General MONAHAN. I have not conducted an evaluation of that proposal, Senator. [Deleted.]

Senator COHEN. Well, it did not strike me as being reasonable. It just raises a question about other claims that are raised about the Brilliant Pebbles, as to whether it is realistic.

Senator NUNN. Where was that? I missed the source.

Senator COHEN. It was a report from Lawrence Livermore Lab, March 1989. I would like to look at that further to see how realistic that is.

Also according to that report, SDIO has specified that the Brilliant Pebbles constellation must work with no strategic or tactical warning. Is that your understanding as well, General Monahan?

General MONAHAN. There is one mode of operation we think can give Brilliant Pebbles a big advantage, Senator, and that is its ability to operate autonomously. That is not the only mode of operation.

Senator COHEN. Say that last word?

General MONAHAN. To operate autonomously, in other words to not rely on other satellites. It does not rely upon complicated communications means in order to do its job, in one mode. [Deleted.]

"BOLT OUT OF THE BLUE"

Senator COHEN. But has the requirement been set out by the SDIO that your baseline will be no strategic or tactical warning? In other words, a "bolt out of the blue?" We have to be prepared for a "bolt out of the blue" against defensive systems, but not a "bolt out of the blue" against offensive systems; is that the situation we find ourselves in now?

General HERRES. There would have to be some tactical warning. By definition there would have to be tactical warning.

[Deleted.]

Senator COHEN. I am just asking, has the standard been set for no strategic or tactical warning?

General HERRES. [Deleted] but it has to have tactical warning by definition. Tactical warning is the warning that takes place once the re-entry vehicle begins flight on its booster, and the sensing of that event is when the tactical warning regime begins.

By definition we have got to have some warning.

Senator NUNN. Would the Senator yield, without losing any of his time, Mr. Chairman, just on this particular point?

Senator EXON. Timekeeper.

Senator NUNN. You can take it out of mine.

Did I understand you, General, to say that it was totally autonomous?

General MONAHAN. There is one mode of operation, Senator, in which it can operate autonomously. Now, it does it in a somewhat degraded manner. The Brilliant Pebbles, because of the sensors on board, is able to detect booster liftoffs and, being able to do that, it is able to attack those boosters without having to get cued by some other source.

Senator NUNN. Well, General Herres, your statement on page 3, you say: "A firm military requirement exists for man in the loop control." It seems like to me something is contradictory between those two.

General HERRES. I think we have a little problem with the definition of autonomous here. What General Monahan means is that autonomous with respect to other elements of the system.

General MONAHAN. Of the system.

General HERRES. But in either case, the system would have to be controlled by a commander responsible for its operation.

General MONAHAN. Absolutely.

General HERRES. Now, what he is really saying is that a mode, a possible mode of operation, would be an interceptor that can see the missile begin its flight without having to depend on a separate sensor with a wider area of surveillance coverage capability to detect and point out that a launch is taking place in a particular location and then cue the interceptor.

Senator COHEN. Maybe I can pursue the question a bit later on in another round.

BRILLIANT PEBBLES

But General Monahan, I would like to come back. On page 9 of your statement, you said that Brilliant Pebbles should be low cost because it is derived from pervasively used military off the shelf, high technologies. And the question I have, for example, you have got miniaturized high-resolution, wide field of view, video imaging systems as one example. But the Lab has indicated that some prototypes have been produced, but the applications of this concept are only in the development stage.

So it would raise a question as to whether this is really off the shelf capability that we are looking at.

General MONAHAN. That is true. I do not believe that you can really go down to a Radio Shack and buy this component. That is not what they mean, I think, by off the shelf.

Senator COHEN. Okay. The other thing, with the supercomputer, with the Cray 1 performance, operating high energy density, D cell size batteries. Apparently you indicated before the Defense Appropriations Subcommittee, the supercomputer would be the size of a cigarette pack. Is that something that is off the shelf available?

General MONAHAN. That is clearly not off the shelf. It is not quite the size of a cigarette pack; probably seven inches by seven inches. But it is developmental.

Senator COHEN. I just want to know whether we are getting all of these, not hype, but exaggerations of the kind of capability we are looking for and the time frame that we are looking at. It seems to me that there are some overstatements being made, both by Lawrence Livermore and certainly by references to these kinds of systems, which are clearly not off the shelf commercially available type of technologies.

General MONAHAN. I think certainly the components are relatively available components that would go on Brilliant Pebbles, and others require development, there is no question about it.

Senator COHEN. My time has expired.

Senator EXON. Thank you, Senator Cohen. Senator Nunn.

Senator NUNN. General Herres, you noted the various aspects of the military requirement. I am still a bit confused on "totally autonomous" and how you get a man in the loop on that, but I do not think that is worth spending a lot of time on right now.

But when General Chain appeared before the committee a few weeks ago to present his annual nuclear deterrence net assessment, I asked him if he needed a Phase I SDI in order to carry out his deterrence mission for the foreseeable future. And his answer was "No."

He went on to say "If we had defensive systems they would be a force multiplier. On the other hand, if we had a pure defensive system and the Soviets did not, that would end up putting us out of balance and could lead to an unstable situation."

Now, that is the CINC. He does not speak for the Joint Chiefs, but that leads to the question: What is the military requirement in terms of deterrence? General Chain evidently does not feel he has to have it in order to deter. Do you believe we need SDI Phase I in order to deter in the foreseeable future?

General HERRES. There are other ways to deter, but I believe they are less desirable. The important thing about General Chain's response is that he is responsible for offensive deterrence, the contribution that offensive forces can make to deterrence. He is not totally responsible for all of the deterrence that our force structure provides.

For example, CINCLANT and CINCPAC provide for a significant amount of deterrence, and we do have other capabilities, as you know very well, that are not under General Chain's control or within his realm of responsibility.

Senator NUNN. In other words, he thinks his offensive systems are enough to deter, but the Joint Chiefs believe there may be additional deterrence required?

General HERRES. Well, I do not know whether that was the context of his answer.

Senator NUNN. He just said "in the foreseeable future." He did not say forever.

General HERRES. I am just simply saying that the responsibility—the strategic defense system is not going to do anything for General Chain other than perhaps protect some of his systems and provide some of the protection of the command and control network that I talked about to give us better assurance that he can set his forces off.

Now, that is a contribution to deterrence that is somebody else's responsibility, rather than his.

Senator NUNN. Okay. He went on to say, in answer to other questions—these were all in answer to questions: "If the U.S. fields defensive systems, I would support the Soviets fielding them simultaneously so that we would continue to have relative stability. I would be very concerned if we ever had one side or the other having a significant disproportionate capability against the other, because then it could lead one to think that one could perhaps have a nuclear war and get away with it."

What is the Joint Chiefs' position, what is your own personal view, on that? Do you think that one side having defensive systems without the other is basically destabilizing?

General HERRES. No, sir. I do not. I think if the party is not interested in going to war and is not interested in threatening anyone, and has a superior capability, I think you have a stable situation. There are a number of countries in this world which have nuclear capabilities. We do not threaten them, they do not threaten us.

I do not think it is necessary for everyone in this world to have equal nuclear capabilities or equal military capabilities to have stability. It depends on intent, national objectives, and a wide range of things.

I think that the idea that the Soviets would have to deploy a strategic defense system at the same time we deploy ours in order to preserve stability is a wrong idea.

Senator NUNN. So you disagree with General Chain and President Reagan on that?

General HERRES. And President Reagan?

Senator NUNN. Yes. He was going to make sure we did it simultaneously by giving the technology.

General HERRES. Well, I do not think that idea completely matured, and I am really not in a very good position to address that because it was not a specifically fleshed-out idea.

Senator NUNN. General Chain went on to say—General Chain did not recommend giving the technology, now. We did not get into that. I do not want to attribute that to him at all. But that is what President Reagan said.

Senator WALLOP. Mr. Chairman, if the Senator would yield. It was not Reagan's view that it would be destabilizing. It was his view that we might give it to them after we developed it. But he never said it would be destabilizing.

Senator NUNN. Okay, I will accept that. He'd just give it to them for philanthropic purposes, whatever.

Senator WALLOP. I never agreed with him.

Again, but it wasn't because it was destabilizing.

Senator NUNN. Let me move to another area. I do not know if that one—obviously, the philosophy behind this whole thing has still got a way to go.

SOVIET AIR AND BALLISTIC MISSILE DEFENSES

Ambassador WOLFOWITZ. Senator, we are in the situation today where the Soviets have massive air defenses and some ballistic missile defenses, and nobody says that is grossly destabilizing. I think that whole notion is a little overwrought.

Senator NUNN. We are spending billions, and have been for years, to counter that, too. And we always have the position that those air defenses are not capable of stopping our bomber force and that is the reason we are spending on B-1s, that is the reason we are spending on Stealth, so we make sure we can counter that.

If we thought those air defenses were perfect air defenses, we would have a different view of it. Otherwise, we are wasting billions of dollars on offensive counter-steps.

But I do not want to get off into that esoteric world. Mr. Chairman, I guess my time has expired, counting what I already used. I will come back in another round.

Senator EXON. Thank you very much, Senator Nunn.

Senator Gorton.

Senator GORTON. For both of you, I think I would like to follow some of the implications of the questions which have been asked here already and ask you how your proposals will, for the short and long-range futures, relate to the START talks?

START TALKS

Let us posit or assume successful negotiations in Geneva for roughly 50 percent reductions, which leave the whole question of SDI in its present status. That may be a difficult position to posit, but let us assume that. Is a continuation both of R&D and an ultimate deployment of some SDI made more important, less important, or not affected at all by a reduction in strategic arsenals of 50 percent on both sides?

General HERRES. From the standpoint of the military requirement, Senator, I would say that there is no question that you would have to re-examine the requirement. Our requirement is based on the representative threat that I discussed earlier and which is derived from an unconstrained Soviet offensive system deployment, and will have to be continually updated as it grows.

A constrained threat would be a different proposition. Negotiating on the numbers that we are talking about today, 4,900 ballistic missile warheads, both sea-based and land-based would be the limit.

I can think of some really good reasons why you still might want a strategic defense system. In my view, it is a significant deterrent to breakout from that treaty. Breakout is going to be one of the most difficult things to verify, and I would be very comfortable with the idea of having a strategic defense system.

It would perhaps—well, it most certainly would not have to be as robust a system as we would have to deploy in an unconstrained world. There are all kinds of interesting possibilities under those circumstances. So I think you have to go back and begin thinking through the operational concept for such a system.

Nevertheless, I think the work that General Monahan is doing now is fully applicable to any of those possibilities. These other reasons and other capabilities—I regard as most important—still would need to be pursued by a ballistic missile defense system, whether we have a START agreement or not.

Senator GORTON. Do you have anything?

Ambassador WOLFOWITZ. No. I agree with that statement very strongly, particularly the point General Herres made about the potential impact on hedging against breakout. But I think the kind of START agreement that we are talking about, with what he said is exactly right. If you talked about very, very deep reductions, then you are getting into the possibility of a negotiating regime where in fact the defenses can do some of the things they cannot do against unconstrained offenses.

Senator GORTON. Well, you have anticipated my next question. At what point in deep reductions, presumably considerably deeper than that 50 percent, does it become militarily desirable or diplomatically desirable, as against the situation in which we find ourselves today, to actually bargain away our freedom of course of action with respect to defenses.

Ambassador WOLFOWITZ. I am sorry, that is different. I was saying that if you go to very deep reductions, defenses become more important, not less, because in fact you then have the possibility of very thorough defenses.

You could talk about—in fact, this is one of the things that we have envisioned—a world where both sides negotiate down to very low offensive capabilities. And then, if the defensive technology proves out, you really have the possibility of a negotiated situation where the defenses really are very effective against one another's forces.

Senator GORTON. So your view then is that it would be even more important not to constrain defenses if we had deeper reductions?

Ambassador WOLFOWITZ. I am not sure about not constraining, but I think that you have some options that would open up on which you would then obviously have to come to a negotiated outcome. Therefore, you cannot say they are unconstrained, but I think you can envisage a negotiated outcome with very low reductions, where in fact both sides permit the other one to have significant defenses, and some of the benefits that both we and the Soviet Union would get from that are related not just to the balance between ourselves, but, as General Herres has said, a number of times, the situation vis-a-vis third countries.

Senator GORTON. Do you have anything?

General HERRES. No, sir. This is a complicated question when we get down into deep cuts and a very robust defensive system. It gets to be a very complicated issue, and you are talking about fundamental changes in strategy.

DEEP CUTS

Senator NUNN. Could somebody define "deep cuts," what we are talking about here, so that we know the definition? What are "deep cuts"?

General HERRES. I assume we are discussing going from say 4,900 in START down to maybe [deleted]. I do not know if that is in sync with anybody else's idea of "deep" or not, but that is sort of what I would think. [Deleted.]

Senator GORTON. Thank you, Mr. Chairman.

Senator EXON. Thank you.

General HERRES. I would just like to add one other thing. Do not forget that there is the air-breathing dimension of this thing, too. We are just talking ballistic missiles, 4,900, and ballistic missile defense. There is the whole air-breathing problem which you have to bring into the concept of all of this when you do start thinking about these changes in strategy, because now these other things become much more important on balance.

Senator EXON. Thank you, Senator Gorton.

We have 2 minutes left. Senator Warner.

Senator WARNER. Thank you, Mr. Chairman. I will pass.

BREAKING OUT OF THE TREATY

Senator EXON. I just have one last question of you, Mr. Ambassador, because of your world knowledge and understanding as a former Ambassador. Would it not cause the destruction of Mr. Gorbachev's self-appointed role as the chief mogul of the world's peace-keepers if he would choose to break out of the treaty?

Ambassador WOLFOWITZ. If the question is would it do some damage to Mr. Gorbachev's present image in Germany if the Soviets were to break out tomorrow—

Senator EXON. That is exactly the question.

Ambassador WOLFOWITZ. The answer is obviously yes. But bear in mind, Senator, we are not talking about what might happen tomorrow. We are talking about what might happen some distance in the future, when Gorbachev may not have that wonderful image any longer or may not even be the leader of the Soviet Union.

We have got to plan for decades in the future.

Senator EXON. I was simply trying to point out, there is always some good that comes out of some bad. [Laughter.]

Senator WALLOP. Mr. Chairman, could I ask one thing? General Herres, General Chain's remarks were given in open session and I know of nothing classified. Could we have that testimony reviewed to see if—

Senator NUNN. It was closed.

Senator EXON. It was closed, I understand.

Gentlemen, thank you very much. There will be some additional questions. Thank you for your promptness and your replies to our questions, and you are excused.

Senator EXON. We will reconvene in 2 minutes for the second panel.

[Whereupon, at 2:45 p.m., the subcommittee recessed, and reconvened at 2:52 p.m. the same day.]

Hearing Resumed

Senator EXON. The subcommittee will please come to order.

Let me welcome our next set of witnesses. Our second panel consists of Gen. John Piotrowski, the Commander in Chief of the U.S. Space Command, and Lt. Gen. George Monahan the director of the Strategic Defense Initiative Organization.

Gentlemen, welcome. We thank you for your patience and we look forward to your testimony.

General Piotrowski, I believe we can probably begin with you.

General PIOTROWSKI. Well, sir, if I may, I prefer General Monahan to talk about the technology.

Senator EXON. General Monahan, fine. We have no objection to that. Whatever is more convenient to you.

STATEMENT OF LT. GEN. GEORGE L. MONAHAN, JR., U.S. AIR FORCE, DIRECTOR, STRATEGIC DEFENSE INITIATIVE ORGANIZATION

General MONAHAN. Thank you, Mr. Chairman.

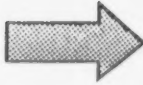
I do have a statement to submit for the record.

Senator EXON. We will accept it for the record, without objection.

General MONAHAN. I would like to give a short presentation which describes some of the philosophy behind the revisions that we are looking at in the program and get into Brilliant Pebbles and some of the alternative architecture that we are looking at.

Could I have the first chart, please.

OUTLINE



- Program Revision
- Phase I SDS
- Alternative Architecture
- Summary



SECDEF TESTIMONY

"The Goal Of The Strategic Defense Initiative Remains Unchanged. We Will Continue To Pursue The General Framework Of Both Space- And Ground-Based Defenses While Providing The Flexibility To Adjust The Specific Deployment Schedule As Evolving Technology Is Tested And Proven. A Restructured Program Would Continue Toward Deployment Of A System That Will Meet The Requirements Of Phase I By Focusing On Evaluating The Potential Of The Most Rapidly Advancing Technologies Such As Brilliant Pebbles."

Richard B. Cheney
Secretary Of Defense
Before The House Armed Services Committee
April 25, 1989

To do that, I will stand up since we do not have to worry about microphones. First of all, in April the Secretary of Defense, Mr. Cheney, in previous testimony before the HASC reaffirmed that the goals of the program do indeed remain unchanged. We are going to continue to pursue both ground-based and space-based portions of the program. We want to be flexible, though, looking at technology as it emerges.

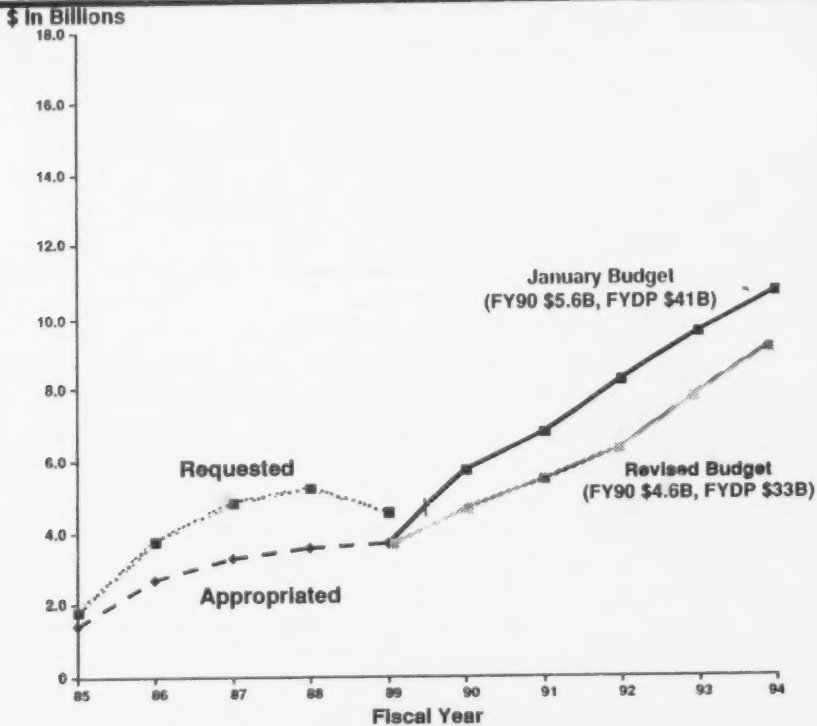
We will continue to address the requirements of Phase I and take a hard look at rapidly advancing technologies such as Brilliant Pebbles.

Now, that is some of the guidance behind the program that I will describe to you today.

Next chart.



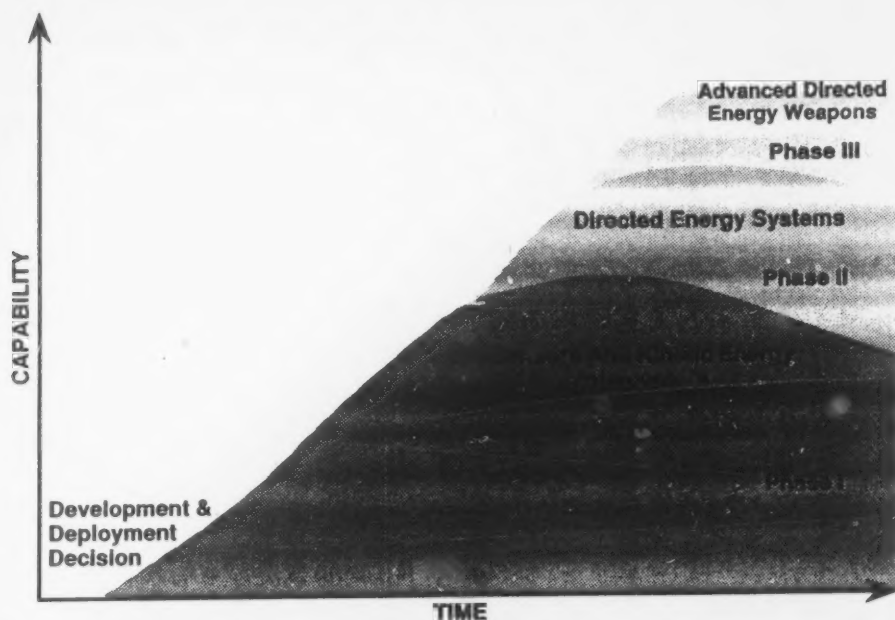
PROGRAM BUDGET



Historically—I believe most of you know this—this chart depicts what was requested, and what was appropriated. Over the period of the next 5 years, the revised budget is a \$33 billion program vice \$41 billion, and specifically in fiscal 1990 \$4.6 billion, rather than \$5.6 billion.



THE PATH TO "THOROUGHLY RELIABLE" DEFENSES



General Herres spoke of this. The requirements for Phase I of the system do indeed remain intact [deleted]. That is the requirement then for the first phase of the strategic defense system [deleted].

Philosophically, the first phase of the program does a couple of things for us. First of all, it deploys the sensors, the infrastructure, that is necessary for both the kinetic energy interceptors and the directed energy systems that we put on later. So it is an important part of the infrastructure that we deploy the necessary sensors and the command and control system that can then accommodate kinetic killers or directed energy killers.



PROGRAM EMPHASIS

- Pursue Activities That Support National Development / Deployment Strategy Decision In Three Or Four Years
 - Reduce Technical Risk And Program Costs
 - Maintain Current Ground-Based Architecture But With Funding / Schedule Adjustments
 - Evaluate Current Space-Based Architecture Against Alternatives Including Brilliant Pebbles Or Revision To The Current Space-Based Elements
- Robustly Fund Activities (Simulations, Experiments) Which Address Operational And Technical Tradeoffs
- Continue Robust Discrimination, Survivability And Countermeasures Program
- Maintain Kinetic And Directed Energy Options
- Proceed With BSTS; Delay FSD 6 Months; IOC 1 Year

Here are the items of program emphasis in the program that we are following as of the present time in order to enable a national decision on development or deployment of the system in the 3- to 4-year time period. We think first of all we need to focus on technical risks and opportunities to reduce costs, and I will describe those in a little more detail in just a moment.

We are satisfied with the current ground-based portion of the architecture. We would maintain that. As far as the space-based portion of the architecture, we see an opportunity perhaps with Brilliant Pebbles, and we will talk about that more in just a moment.

So we are looking at alternatives there.

The National Test Bed is a very key facility that we have, and that is where we do simulations and experiments which allow us to do operational and technical tradeoffs. We will robustly fund that. As a matter of fact, where most items in the program elements will have to suffer funding reductions, here is one area where we think, in order to look at alternative architectures, that we need to increase the funding somewhat and plan to do that.

Obviously, these three tough areas of discrimination between re-entry vehicles and decoys, survivability, and countermeasures need continued work.

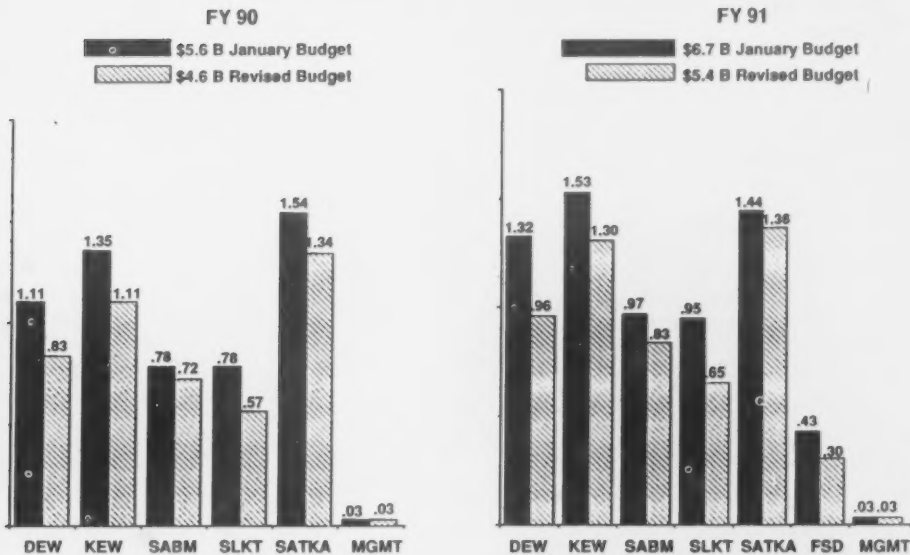
Maintaining the kinetic and directed energy portions of the program and proceeding with the BSTS program, we are delaying that 6 months for a technical reason, but proceeding with the Boost Surveillance and Tracking System satellite because it performs the

threat warning/attack assessment that is now performed by the Defense Support Program satellites.



FY 90 - 91 SDIO BUDGET

Program Elements (\$ In Billions)



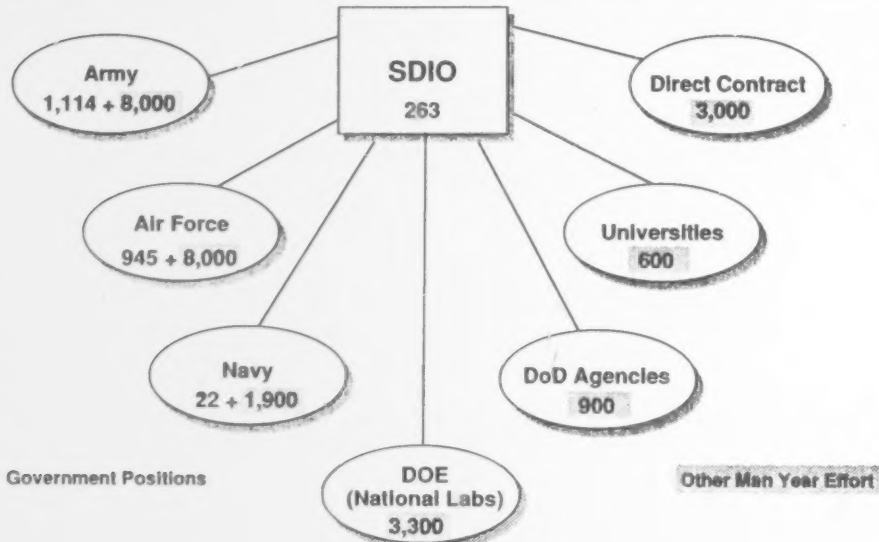
Here is the way that we have notionally accommodated the reductions from \$5.6 billion down to \$4.6 billion for next year. We do not have final decisions on these yet. I hope to be able to make those final decisions in the August time frame, perhaps just a little bit later.

Directed Energy Weapons, and Kinetic Energy Weapons are listed. The acronym SABM means Systems Analysis and Battle Management. SABM includes things like the National Test Bed facility. The other acronyms means Survivability, Lethality, and Key Technologies; and then Surveillance, Acquisition, Tracking, and Kill Assessment.

As you can see, and as I believe was raised earlier by Senator Bingaman, Directed Energy Weapons on a percentage basis are going to have to be reduced a little bit more percentage wise, than some of the other areas if we are to accommodate maintaining the capability to pursue Phase I of the program and to do that in anywhere like a timely manner. I will discuss the schedules in just a moment.



COORDINATED NATIONAL EFFORT



Approximately 28,000 Man Years



TOP TECHNICAL RISK AND COST REDUCTION EFFORTS

Technical Risk

- **Phenomenology And Targets** - Discrimination And Backgrounds
- **Communications** - Operate Thru Nuclear Environment
- **Radiation Hardening** - Focal Plane Arrays / Signal Data Processors / Optics
- **Space Power** - Reduce Size / Survivable
- **Survivability** - Hardened Components / Architecture
- **System Integration** - Sensor To Weapon Handover / System Level Command And Control

Cost Reduction

- **Optics** - Be / Glass Mirrors / Production Process Enhancements
- **Focal Plane Arrays** - Increased Yield / Process Controls
- **Signal Processors** - Increased Yield / Qualified Manufacturing Lines
- **Space Power** - Automated Manufacturing Of Solar Cells
- **Architecture** - Alternative Space Based Architectures
- **Materials & Structures** - Lightweight, Durable, High Strength
- **Launch** - Efficient Means Of Deployment

Just for your information, about 28,000 people equivalent in the United States are working on the program today. We use the Army and the Air Force to a large extent to pursue various elements of the program. We have a lot of effort going on in universities right now. Other DOD agencies and the national laboratories also participate.

The numbers in green are mostly in contractor personnel.

I mentioned the technical risk reduction effort that we really have to work hard on for the next 3 or 4 years. This is our assessment of the top technical challenges in the program as of this time and where we think the greatest opportunities for cost reduction are.

There are many of you, I believe, who have probably had some information on these items in the past. I will not get into them in any great detail, but simply let you know that indeed I think we have a very good handle on just what we need to pursue.

In focal plane arrays, for example, we need to continue cost reduction efforts. [Deleted.]



NATIONAL TEST BED

- Provides Capability To Develop, Test & Verify Strategic Defense System Concepts And Architectures
- Nationwide Network Of Test Ranges, Military Organizations, Laboratories And Industrial Centers Tied To The 450,000 Sq Ft National Test Facility (NTF) At Colorado Springs
 - Unique Ability To Perform Full Range Of Simulations, Test Analysis, And Command Center Development
 - Permits System Hardware Test Definition Reducing Risk & Cost
 - Integrates Real Time Experimental Data Into Simulations To Verify Predicted System Performance

I mentioned the National Test Bed earlier. This chart shows you what it does. It is a major facility being constructed out at Colorado Springs and it should be open in April 1990.



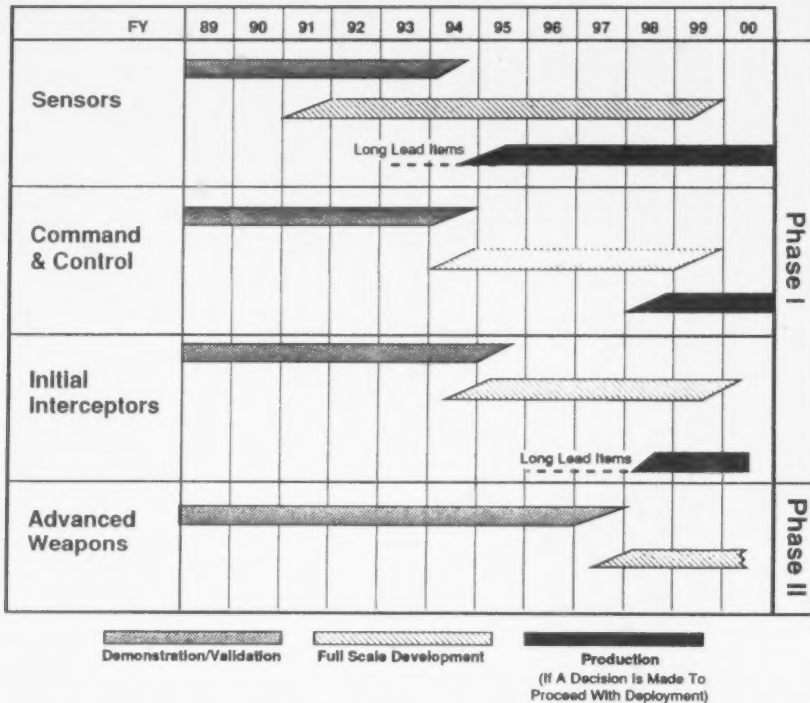
NATIONAL TEST FACILITY RESEARCH BUILDING



Here is a picture of it under construction, and we will use that facility to, as I said earlier, do the operations and engineering tradeoffs necessary as we put the various elements of the entire program together.



SDS PROGRAM SCHEDULE



Schedule-wise, things look like this as of the present time. Phase I of the program, the sensors and the command and control are shown as first. This is the infrastructure that supports not only the initial interceptors, but also the Directed Energy Weapons that will come later on. In green is shown full-scale development.

This says that full-scale development started with initial sensors here in 1991, and that's for the BSTS sensors. Other sensors, as we see it at the present time, would initiate out here in the 1994 time frame, as well as the command and control system.

The initial interceptors, both ground-based and space-based, also we think would enter full-scale development in about fiscal year 1994. We are in demonstration/validation phase right now.

I will talk about Brilliant Pebbles just a little bit more in just a moment. We could probably do this back a year or so if the Brilliant Pebbles program looks to us as if it would be successful.

OUTLINE

- Program Revision
-  • Phase I SDS
- Alternative Architecture
- Summary



SDS PHASE ONE PROGRAM

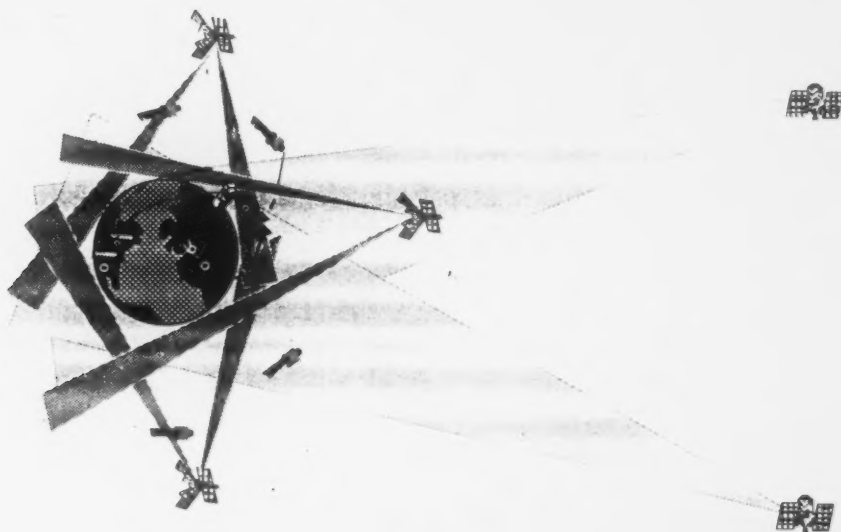
Major Elements

- BSTS** - Boost Surveillance And Tracking System
- SSTS** - Space Surveillance And Tracking System
- GSTS** - Ground-Based Surveillance And Tracking System
- GBR** - Ground Based Radar (Pending)
- CC** - Command Center
- GBI** - Ground-Based Interceptor
- SBI** - Space-Based Interceptor

We have a tremendous amount of alphabet soup in this program. I just want to explain a couple aspects of it that I think are very important for you to understand. These are the major sensors right here. I will show you a chart in a moment that explains it a little better. The command center, and then the Ground-Based Interceptors, and Space-Based Interceptors. That is what Phase I of this program amounts to.



PHASE ONE ARCHITECTURE

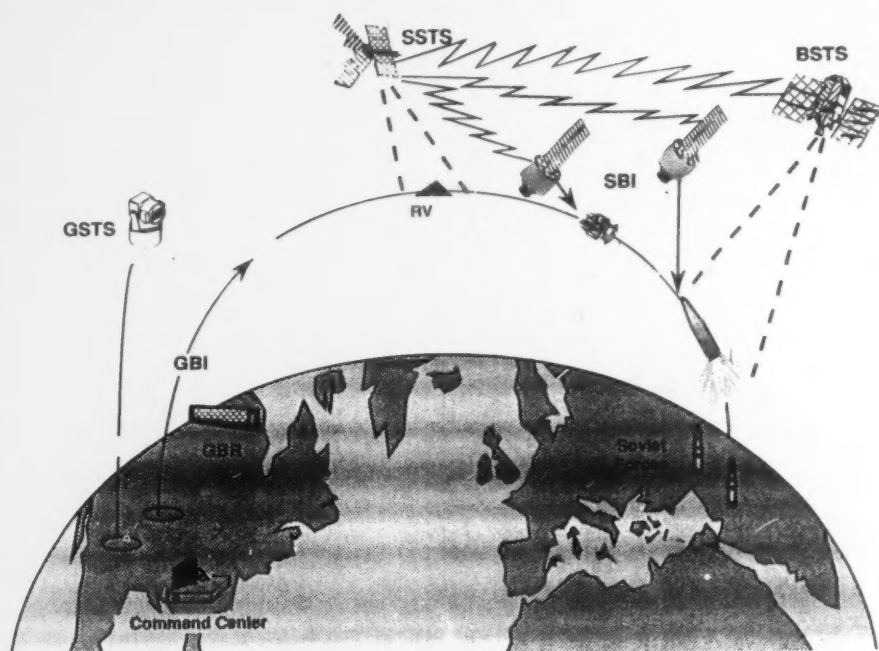


How is it put together? Well, first of all, this is the Boost Surveillance and Tracking System (BSTS). That is the bell-ringer satellite. [Deleted.]

The next satellite in is Space Surveillance and Tracking System (SSTS). As you can see, it looks across here, and its task is to find these clusters of re-entry vehicles and decoys and be able to pass those on to the ground-based elements of the system or Space-Based Interceptors as well.



SDS PHASE ONE ARCHITECTURE



15

Let us bring this in a little bit closer now on the next chart. I just described the BSTS satellite and SSTS satellite. The other portion of the space-based architecture is the Space-Based Interceptors. The Space-Based Interceptors in a conventional sense are housed 10 in a vehicle, represented here, and their primary mission is to intercept boosters. And these are post-boost vehicles here that have nuclear weapons on the bus. In other words, after being deployed from the booster, the booster burns out.

Then the re-entry vehicles are carried along on the bus for a period of a few minutes as the re-entry vehicles are dropped off. When the re-entry vehicles are in midcourse they can be attacked by the Ground-Based Interceptors. The Ground-Based Interceptors are cued by the Ground Surveillance and Tracking System, which is a sub-orbital probe. This does not go into orbit, but is stationed along the northern tier of the United States after being cued by the SSTS, the BSTS.

It is launched, gets a good close look at the cluster of re-entry vehicles and decoys, and is able to sort out between the two.

The Ground-Based Radar also does that kind of a function, but, because of the excellent resolution characteristics of that radar, it is able to do, we think, an excellent job of discrimination, and it is another phenomenon used to do the discrimination job.

So these are the elements of the first phase of the program.



CANDIDATE FOLLOW-ON ELEMENTS

Element Name	Key Functions
HEDI - High Endoatmospheric Defense Interceptor	• Destruction Of RVs After Atmospheric Reentry
NPB - Neutral Particle Beam	• Disabling Of Boosters, PBVs, RVs And ASATs • Interactive Discrimination
SBL - Space-Based Laser	• Destruction Of Boosters, PBVs And ASATs • Interactive Discrimination
GBL - Ground-Based Laser	• Destruction Of Boosters, PBVs And ASATs • Interactive Discrimination

Nothing more than that.

Then the follow-on phase of the program as we envision it right now would consist of, first of all, these three Directed Energy Weapons systems: Nuclear Particle Beam, Space-Based Laser, Ground-Based Laser, and also possibly a ground-based interceptor called a HEDI, a High Endoatmospheric Defense Interceptor. It would intercept at the terminal phase, in other words after the re-entry vehicles have re-entered the atmosphere—a tough thing to do technically.

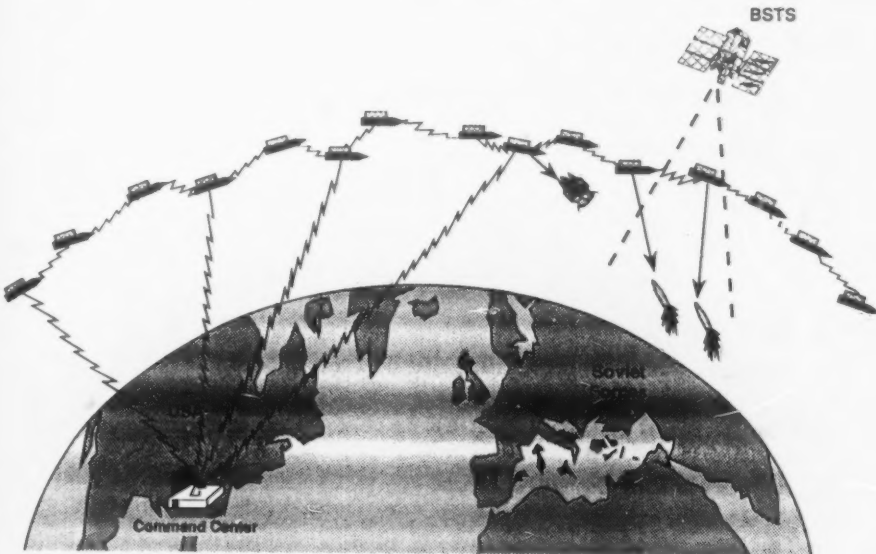
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OUTLINE

- Program Revision
- Phase I SDS
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- Summary



SDS ALTERNATIVE ARCHITECTURE



Let us just talk for a moment, then, about Brilliant Pebbles. Remember I described that space-based portion of the architecture, in particular the Space-Based Interceptors and the carrier vehicles. In the case of Brilliant Pebbles, they are deployed not 10 to a vehicle, but notionally and we think right now perhaps the best way is in singles, each within a lifejacket, a small lifejacket.

It would have the capability to communicate from Pebble to Pebble. The number of Pebbles is something that has to be worked on yet, ranging from perhaps 4,000 to 8,000 to 10,000, depending on how robust a system one would like to have.

The Pebbles would have the ability to communicate with one another, to communicate with other satellites, and be able to communicate, obviously, with the command center.

When I said autonomous earlier, I meant that they can operate autonomously from other satellites and other equipment. But they have to be initiated by a man in the loop. The system will be set up in that way, that they may not launch, they may not fire, may not be initiated, unless they get the signal from the ground to do so.



BRILLIANT PEBBLES CONCEPT - SBI

Functions

- Destruction Of Boosters And PBVs
- Surveillance And Target Acquisition
- Laser 2-Way Communications

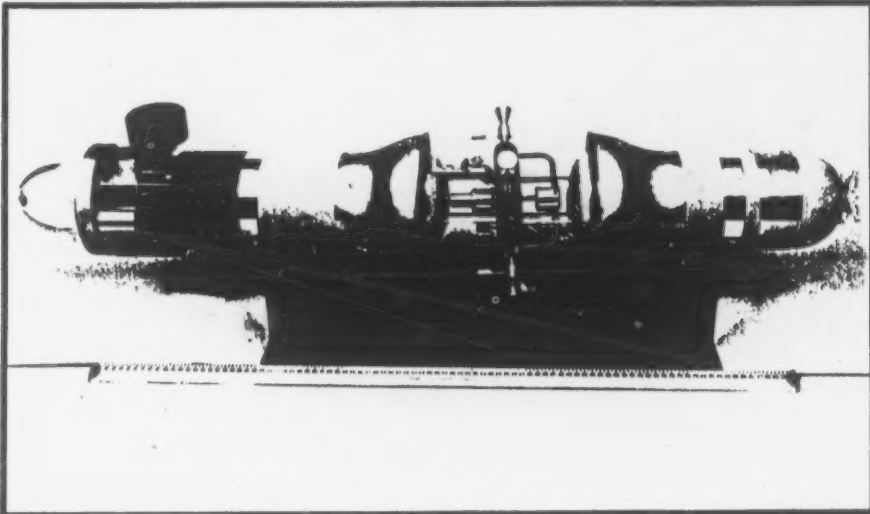
Characteristics

- Interceptor Orbits In Protective Shell / Life Jacket
- Low Cost / Light Weight (88 Lbs)
- Highly Survivable Singlets
- Hit-To-Kill

This just describes a little bit of what I said. The thing that is different about Brilliant Pebbles from the conventional Space-Based Interceptors, is that they have this capability of surveillance and target acquisition that the other conventional interceptors do not have.



BRILLIANT PEBBLES



This is a picture of a model, and whether they ultimately look like this I do not know—I think there will probably be some changes. There are very interesting sensors on here. [Deleted.]

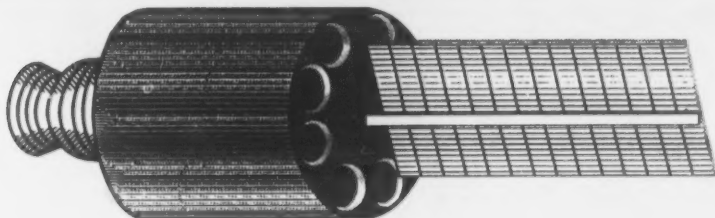
The laser radar is up here; and then two other sensors located here. [Deleted.] The combination of those two are what allow the surveillance and acquisition and target tracking to take place.

The laser radar here assists in the end game in hitting the target very precisely in the last couple of seconds.

These are just divert nozzles here, and most of this is fuel tank—about 80 pounds.



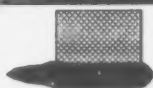
COMPARISON SBI & BRILLIANT PEBBLES



SBI Carrier Vehicle



SBI Interceptor



Brilliant Pebbles Life Jacket



Brilliant Pebbles Interceptor

Now, why do we think we can do this cheaply? I think this is the major reason right here. As you can see, these Pebbles would replace this in our architecture. Hopefully, mass produce them. And by the way, they have a lot of characteristics of air-to-air missiles, so rather than costing like \$10,000 to \$20,000 a pound like a satellite or spacecraft costs, maybe it is closer to \$500 or \$1,000 a pound, like an air-to-air missile. And that is something we are looking at at this time.



BRILLIANT PEBBLES PROGRAM PLAN

- Brilliant Pebbles Is Potentially A Valuable Contributor To A Strategic Defense System
 - Possibly The Centerpiece Of SDI
 - Low Cost Potential Is Featured
- But In Very Early Stage Of Research / Development
- DoD Will Perform An Indepth Evaluation
 - Independent Review(s)
 - Also, Red Team / Blue Team
- DoD Will Develop A "Bottoms Up" Cost Estimate (Defense Acquisition Board Quality-Milestone I)
 - Air Force Cost Estimate . . .
 - Independent Review By SDIO Agent . . .
 - DOD Cost Analysis Improvement Group (CAIG) Evaluation

Well, I think Brilliant Pebbles could potentially be a very valuable contributor to the program. It might even be the centerpiece to SDI some day. We do not really know, but it is very early in research and development. So this summer we are performing two independent reviews, one by the Defense Science Board, one by another organization known as the JASONS, which is a university-oriented group, to take a look at this concept with regard to its feasibility. They will question whether it looks like a feasible thing to do.

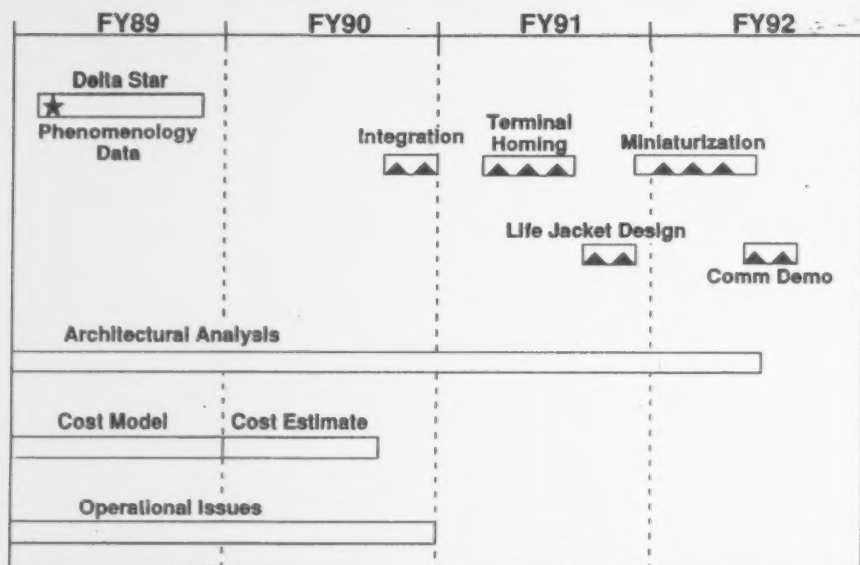
General Piotrowski's people in Space Command are looking at it from the operational point of view. We are going to do a red team-blue team effort. And all of this is kicked off and under way at the present time.

And finally, we have the Air Force doing a bottoms-up cost estimate. We will do an independent review of that and then have the Cost Analysis Improvement Group (CAIG) at the Pentagon review that also.

We will get that work completed by this fall. Now, notionally what would a Brilliant Pebbles program look like?



NOTIONAL BRILLIANT PEBBLES DEVELOPMENT



Let me describe a program that we think notionally would constitute a demonstration/validation phase, with full-scale development to follow. The program that we put together that would stay within the restrictive interpretation of the ABM Treaty: 12 tests out here, 1990 to 1992. These would be sub-orbital, up here. And then the life jacket would be orbital, as well as the communications demo.

Finally, out here we would have a "defanged" interceptor, and this is being reviewed now by the treaty compliance review group to make sure that we do indeed stay within the treaty, and we plan to do that. I think that we can.

If we cannot, we will not pursue it. But our plan is to do just that.

OUTLINE

- Program Revision
- Phase I SDS
- Alternative Architecture
-  • Summary

SDS PROGRAM

[Chart deleted.]

Finally, let me bring up a couple of other points here. I just put this in. It is not in your handout. What happened when we went from the \$41 billion program down to the \$33 billion program? Well, here is what happened to the program element by element. I mentioned the BSTS. It slipped just 6 months. But the other items of the program—as you can see here, green means full-scale development. The other sensors up here, the command center, all of them now have moved out 1 to 2 years and are all arrayed pretty much out here in the fiscal 1994 time frame.

This is primarily caused by financial constraints that we have to do it this way. There is a possibility that maybe we can pull some of them back in. We do not know yet for sure, but I think that it is going to be somewhere in that vicinity before a full-scale development decision can be made.

So you see, that slips things down a couple of years. If after the evaluations that we do this summer of Brilliant Pebbles turn out positive and that testing turns out good, we could start full-scale development back here in 1993 and keep ourselves very close to the same sort of schedule that we were on for the Space Based Interceptor.

So I think that if the Brilliant Pebbles looks like it is going to work out, we could probably just about stay with at least that part of the space-based architecture—the space-based interceptor—and probably be able to maintain our original schedule.



SUMMARY

- **Orient Program To Support National Development / Deployment Strategy Decision In Three or Four Years**
- **Evaluate Brilliant Pebbles And Space Based Alternatives**
- **Ongoing Emphasis On Risk Reduction**
- **Enhance Cost Reduction Efforts In Producibility**
- **Maintain Kinetic And Directed Energy Options**
- **Continue Robust Discrimination, Survivability And Countermeasures Programs**
- **Maximum Utilization Of The National Test Bed**

ABM TREATY CONSTRAINTS

[Chart deleted.]

The treaty issue came up earlier. I like to use this chart. It might be an oversimplification. Actually, the treaty is pretty simple; it is a very slender document. But the interpretation is very difficult.

Let me just make a couple of points. What can we say with certainty about the treaty? We can say that for either ground or space-based systems we are allowed to do research, we are allowed to do a certain amount of development.

Let me go over here now. We clearly may not deploy space-based systems. We clearly may not deploy ground-based systems beyond 100 ground-based interceptors that are "traditional," not based on other physical principles. Well, then you get into the contentious part down here, and all that has to do with testing and whether you are in maybe a restrictive interpretation or a broad interpretation and whether or not you think certain components are based on other physical principles or not.

So you can do a lot here. You clearly may not out here without doing something about the treaty. And then this is a period of time in here that may or may not truly be important to us. Let me just show you and try to give you a feel for where we run into the treaty and what kind of difficulties it causes us and what is a good way to deal with it.

First of all, the original program was the \$41 billion program, now the possible schedule reflects the new \$33 billion program. I

believe I said earlier that we may run into the treaty about 1994, 1995. Note that I have a question mark here. I do not have a question mark, however, out here.

So as of the present time there is no doubt, whether you accept a broad interpretation, a narrow interpretation, or whatever, we clearly would get beyond the treaty out here in about the 1998 time period. There is no question about that.

Here it depends upon a number of factors: what is treaty compliant, what is not treaty compliant, regarding the sensors; do we finally have to do some testing when we are in full-scale development of Brilliant Pebbles or Space-Based Interceptors that would be a violation of the narrow interpretation of the treaty?

It is somewhere out in this time period, probably not quite that early, but right around in here (indicating), where we probably would have to do that kind of testing before we could deploy a system. So up until that time we can operate pretty well without difficulty, but there is no question that once we get out here before we deploy we certainly have to understand what we have to do about the treaty.

I do not believe I need to go into that. That just summarizes most of what I have said here today.

And that concludes my presentation for the moment, and I leave it to General Piotrowski.

[The prepared statement of General Monahan follows:]

**STATEMENT ON
THE STRATEGIC DEFENSE INITIATIVE**

BY

**LIEUTENANT GENERAL GEORGE L. MONAHAN
DIRECTOR
STRATEGIC DEFENSE INITIATIVE ORGANIZATION**

Mr. Chairman, thank you for the opportunity to appear before this subcommittee today to testify in support of the Strategic Defense Initiative (SDI) budget request.

Secretary of Defense Cheney submitted to Congress the fiscal years 1990/91 amended budget request for the Department of Defense on April 25, 1989. The request for the SDI program for fiscal year 1990 is \$4.6 billion and \$5.4 billion for fiscal year 1991; a billion dollar reduction from the original fiscal year 1990 request and a billion three hundred million from fiscal year 1991 request.

As the Secretary has stated, the goal of the Strategic Defense Initiative remains unchanged. In fiscal year 1990 and 1991 we will continue to pursue the general framework of both space- and ground-based defenses while providing the flexibility to adjust the specific deployment schedule as evolving technology is tested and proven. SDI will continue toward deployment of a system that will meet the requirements of Phase I by focusing on evaluating the potential of the most rapidly advancing technologies such as Brilliant Pebbles. To pursue our objectives, we will continue to maintain program balance: a balance between technology base research and validation experiments; between boost phase, midcourse, and terminal phase programs, and between mature and advanced technologies. Specifically, we will complete planned, ABM Treaty compliant, flight tests supporting

the ground-based and space-based interceptors and space-based sensor experiments; provide for a competitive analysis and evaluation of ground-based and space-based elements of the system architecture; and provide for an aggressive program to evaluate concepts, such as Brilliant Pebbles.

One of our primary programmatic objectives is to continue to emphasize the importance of cost reduction and enhanced producibility techniques in our research efforts. SDIO will continue to sponsor research that will consider reducing the costs of systems both through cost performance tradeoffs and the infusion of emerging technology. Two of our ultimate goals are a properly balanced architecture that allocates functions in the most economical way and an industry that efficiently adds value to its products using the widest technology and capital base.

One example of our effort to economize the SDS architecture involves Brilliant Pebbles. Brilliant Pebbles is a concept for an alternative space-based element which is described in more detail later. The Brilliant Pebbles concept emphasizes low-cost, miniaturized components, and could potentially reduce the cost of the overall SDS architecture by a considerable amount. I stress "potentially," because the concept is very early in the research phase and still embodies many operational and technical unknowns. To address these unknowns, we are sponsoring several cost and feasibility study efforts this year to determine the viability of this concept.

An example of our efforts to exploit the capabilities of high innovation in industry is the Inertial Measurement Unit (IMU), a device used for navigation. Ten years ago an IMU was the size of a bread box and cost approximately \$70,000. By the fall of 1988, SDI program research reduced the size of the IMU to that of a softball for approximately \$10,000 a piece. We have continued to improve and the IMU is now approximately the

size of a tennis ball and costs \$5,000 a piece. Miniaturization techniques and development of low-cost alternatives are driving the SDI program to produce less-expensive strategic defense options.

The classified Report to Congress on the SDI Program was submitted to the Congress on January 19, 1989, and the unclassified version on March 14, 1989. This report describes in detail the content of the total SDI research program. Therefore, with your indulgence, I would like to take a few minutes to highlight some very important points from the report. First, the SDI research program seeks to develop both mature and advanced defense technologies. For example, kinetic energy systems which would be deployed in the initial phase of a defensive system and directed energy weapons (lasers, particle beams) are being researched with equal dedication. Second, advanced technologies are integral to the program's success in countering potential Soviet responses to a deployed Strategic Defense System (SDS).

I would like to review for this Committee the major elements which could make up an effective defensive system. The hardware specifications for an initial defensive system, Phase I, are not absolutely fixed. Continued progress in the demonstration/validation phase or in technology development may result in substitutions or additions of elements.

BOOST PHASE SENSORS

BOOST SURVEILLANCE AND TRACKING SYSTEM (BSTS):

BSTs would be a missile launch warning system that detects launches, identifies boosters, and predicts booster tracks of attacking ICBMs and SLBMs. Deployed in high earth orbit for optimum viewing and survivability, BSTS would use advanced sensors and processing techniques to track missiles by observing the missiles' hot exhaust plumes. Technology programs, ground

demonstrations, and optical measurement programs are in process and focus on developing a complete understanding of the phenomenology and system design requirements. Ground demonstrations are scheduled to support both a system design selection and a full scale development decision in early 1991. The first BSTS deployment is planned for the mid-1990s, and is needed to maintain our ballistic missile early warning mission (BMEWs) independent of strategic defense.

MIDCOURSE/TERMINAL PHASE SENSORS

Detection, tracking, discrimination, designation and hand-over of targets in midcourse would be accomplished by a suite of cooperative sensors. Sensor concepts for the midcourse region consist of the Ground-based Surveillance and Tracking System (GSTS) and Space-based Surveillance and Tracking System (SSTS). The Ground-based Radar (GBR) would provide a late midcourse and high endoatmospheric active sensor system to track and discriminate surviving reentry objects.

The midcourse sensors would work together with handoff from BSTS to track offensive ballistic missiles, post-boost vehicles, reentry vehicles and other objects. Target data, weapon assignment, and fire control in-flight update information from the midcourse sensors would be transmitted to the defensive interceptors.

GROUND-BASED SURVEILLANCE AND TRACKING SYSTEM (GSTS):

GSTS would be a fast-response rocket-launched long-wavelength infrared (LWIR) sensor system boosted into suborbital flight for use in the midcourse layer. GSTS would enhance strategic defense robustness by providing a reconstitution capability. GSTS would be operationally integrated with SSTS and GBR to provide track and discrimination data. With handoffs from

SSTS, GSTS would search selected corridors, flying close to threat trajectories in order to resolve closely spaced objects. GSTS would be used to cue GBR for objects/clusters requiring further discrimination.

The GSTS project is developing concepts and multiple sensor designs under a single prime contractor and two sensor subcontractors. A GSTS sensor design will be selected based on critical sensor component technology experiments and sensor test bed results.

SPACE SURVEILLANCE AND TRACKING SYSTEM (SSTS):

The SSTS would be a constellation of satellites and ground stations that perform midcourse tracking necessary to commit defensive interceptor systems. The primary sensing payloads of the SSTS satellite would be a LWIR passive sensor (common with GSTS) and a visible ultraviolet passive sensor. The primary mission of SSTS would be to track Post-Boost Vehicles (PBVs), target clusters, and anti-satellite weapons.

In peacetime, SSTS would be able to perform valuable foreign target signature collection and satellite tracking functions. The early satellites would gather phenomenology data required for design optimization of surveillance and seeker systems.

Development of the concepts and design for SSTS is under way with two prime contractors. The contractors will provide end-to-end ground demonstrations of their concept designs. Under the current plan, one concept will be selected and a prototype SSTS satellite system will be fabricated.

GROUND-BASED RADAR (GBR):

The GBR became a candidate for inclusion in the midcourse sensor suite, along with the SSTS and the GSTS, based on recommendations of the Midcourse Sensor Study. The GBR would provide

track, search, acquisition, discrimination, and kill assessment functions. In addition, the GBR would accept target handover from other sensors and provide track and homing data for ground- and space-based interceptors. The GBR would be a single-faced, x-band phased array radar. It would provide enhanced discrimination by measuring the microdynamics of space-borne objects. Two basing concepts are under consideration: fixed and mobile.

Concept definition will continue during fiscal year 1990. The project will perform threat/radar response evaluation and analyses leading to multiple GBR system design concepts. Each concept will be evaluated in sufficient detail to establish system effectiveness, technical and programmatic risks, cost estimates, and interface requirements. Two GBR concepts will be selected for a competitive 12-month preliminary design phase.

DEFENSIVE INTERCEPTORS

GROUND-BASED INTERCEPTOR (GBI): *

GBI would be a ground-launched exoatmospheric interceptor which could conduct hit-to-kill intercepts of ICBM and SLBM RVs in the late midcourse phase of their trajectory. The midcourse sensors would acquire, track, and pass target information to the ground-based command center element. The ground battle management segments would discriminate, assign interceptors to targets, provide trajectory and launch data to the interceptor, and communicate target vector updates to the interceptor in flight. The interceptor would have some on-board discrimination capability to relieve data rates and processing requirements on board the midcourse sensor.

The GBI development program has two parts: (1) demonstration and validation of the concept and technologies, and (2) development of advanced exoatmospheric interceptor technology.

* The Exoatmospheric Reentry Vehicle Interceptor Subsystem (ERIS) is the Dem/Val portion of the GBI project.

SPACE-BASED INTERCEPTOR (SBI):

The SBI would be a chemical-powered, kinetic energy system designed to engage enemy targets in the boost, post boost, and early midcourse portions of their trajectories. The current design would utilize a carrier vehicle constellation with each carrier vehicle carrying ten interceptors. SBI would be linked to BSTS and SSTs.

The SBI will engage the threat in the boost, post boost, and midcourse phases. However, SBI would obtain the maximum defense leverage by intercepting boosters and PBVs before they have a chance to deploy RVs and decoys.

Changes in the SBI concept from 1988 to 1989 reflect the results of successful research to improve performance. Because of major advances in the projectile portion of the SBI, the weight was reduced, allowing each interceptor to operate at increased velocity and range, thus reducing the satellite constellation. In addition to design changes, employment tactics have improved which will result in the destruction of additional RVs for equal number of SBIs. This improved effectiveness has been utilized to maintain the SBI role in meeting operational requirements while reducing constellation size.

Although the present architecture calls for SBIs to be garaged in groups of ten interceptors, the interceptors could be deployed, with modification to battle management and surveillance requirements, as free flying "singlets." The concept of a singlet, in which the total surveillance is built into the interceptor, is embodied in a concept called Brilliant Pebbles. This interceptor would be autonomous. Given a positive release

command, the interceptor would use its own sensors to acquire a target and engage it without external tracking data or other assistance.

The interceptor should be low cost because it is derived from pervasive use of miniaturized commercial and military "off-the-shelf" high technologies, including miniaturized high-resolution/wide-field-of-view video imaging systems that work from the mid-UV to the mid-IR range, a super computer with Cray-I performance operating off high-energy-density "D-cell" sized batteries, a miniaturized high-power laser imaging radar/communications system, and a high-mass monopropellant propulsion system.

This fall, subsequent to Brilliant Pebbles study efforts described above, we will reexamine our space-based architecture with a view towards the degree of incorporation of this singlet concept.

BATTLE MANAGEMENT/COMMAND, CONTROL, COMMUNICATIONS:

This component has been redesignated the Command Center/System Operation and Integration Functions (CC/SOIF). The Command Center element would provide positive, survivable, and secure human control over the SDS. It would consist of fixed and mobile units and a terrestrial communications network with ground entry points for interconnectivity to the space components. CC would also support coordinated offense-defense operations and interfaces with other U.S. government agencies.

The System Operation and Integration Functions include the distributed information processing network needed for the automated execution of a human-selected battle plan. This would require both the assured, secure exchange of information between the CC and all SDS elements, and the data processing to identify targets, allocate weapons, execute the defense and assess its

success, and manage the system's resources.

A baseline CC/SOIF architecture has been identified, with automated decision functions allocated to interceptor and sensor elements.

FOLLOW-ON TECHNOLOGIES

Advanced defenses, necessary to maintain and improve the initial defensive system capability, may include some or all of the following major candidate systems, depending on the threat response and the technological progress. Or, if more promising, one of these could be moved to the initial phase. In the phased approach to development these concepts could be introduced into later SDS deployment phases as they reach technical maturity and as mission requirements change.

HIGH ENDOATMOSPHERIC DEFENSE INTERCEPTOR (HEDI):

HEDI is a ground-based, hypervelocity, high acceleration interceptor that could engage ballistic missile RVs in the upper atmosphere. HEDI is the most mature interceptor of the follow-on SDS architecture. Its contribution would be an additional defensive layer to further reduce RV leakage rates. HEDI would be integrated with midcourse sensors using the CC/SOIF.

The midcourse sensors and associated CC/SOIF would be used to provide RV detection and discrimination, determine the RV intercept point, select the appropriate trajectory for engaging each RV, and issue a launch command to the interceptor.

HEDI research is focused to resolve specific technology issues dealing with aero-optical effects, window and forebody cooling, shroud removal, non-nuclear warhead kill and guidance and control. HEDI could enter the DEM/VAL stage in fiscal year 1990.

DIRECTED ENERGY WEAPONS:

Directed energy devices are exceptional candidates for ballistic missile defense missions. They possess unique characteristics such as near speed-of-light delivery and long-range and multiple-shot capability that could significantly enhance the effectiveness and responsiveness of an evolving, sequentially deployed SDS. Directed energy systems, such as those described on the following pages, would be capable of evolutionary growth from an early boost-phase intercept capability to the performance levels required to negate robust, long-term responsive threats.

NEUTRAL PARTICLE BEAM (NPB):

The NPB would produce a stream of atomic particles to penetrate into a target and provide lethal energies to disable or destroy RVs. The NPB could be utilized in the boost, post-boost and midcourse regions. The NPB would be capable of effecting electronics kill on launch systems in the boost and post-boost portions of the trajectory. The more robust NPB would increase target handling and would have the ability to attack and disable or destroy RVs in the midcourse region. When used for the boost/post-boost defense mission, the NPB would consist of a number of platforms in space. When used for the midcourse discrimination mission, neutron sensor satellites would be colocated with NPB platforms in space.

CHEMICAL LASER/SPACE-BASED LASER (SBL):

As presently conceived, the hydrogen fluoride chemical laser is the most likely candidate for a SBL. A constellation of SBLs would consist of orbiting, highly autonomous battle stations capable of directing extremely powerful and agile infrared laser beams on targets. These battle stations could destroy missiles in boost phase down to the cloud tops. They could also

provide interactive discrimination by destroying simple decoys (e.g. balloons) and thermally tagging or imparting a velocity change to more sophisticated decoys. Demonstration and validation of SBL technology will occur in the Zenith Star program.

GROUND-BASED FREE ELECTRON LASER (GBFEL):

The GBFEL would generate an intense laser beam capable of boost-phase intercept and interactive midcourse discrimination. The high-energy laser beam would be transmitted via the beam control subsystem, which would correct the beam for proper transmission through the atmosphere to relay mirror spacecraft. The beam is then redirected and focused on the target. The GBFEL program is structured to pursue Dem/Val in the early 1990s.

BALANCED SDI PROGRAM

Sustained and focused technology advances are requisite to developing and maintaining a viable SDS. Accordingly, SDIO program strategy balances both basic research and focused technology development with system development. Advances that have resulted from these balanced technology efforts are necessary for a thoroughly reliable defense. They also serve to maintain the viability of Phase I deployments against responsive threats. Examples of progress in this area include the many sensors, processors and control elements associated with the acquisition, tracking, pointing, and fire control necessary to orchestrate an SDS. Chapter 6 of the Report to Congress on the SDI Program contains a comprehensive description of the SDIO technology base research accomplishments, and future plans.

SDI research accomplishments have increased our confidence that strategic defenses will prove feasible. In past years, SDIO has conducted a series of kinetic energy and directed energy weapon technology tests. Kinetic energy tests have suc-

cessfully demonstrated the capability to intercept and destroy -- by non-nuclear means -- enemy ballistic missiles before they reach their targets. The first of a series of "hover tests" of a space-based interceptor have been conducted in a ground test facility. These tests help evaluate the capability of fast acting thrusters to keep a sensor pointed at a target, and the interaction of the sensor and guidance systems. The most recent successful hover test was conducted on April 25, 1989, when a SDI projectile facsimile hovered and maneuvered for 21 seconds.

The Aerothermal Reentry Experiment (ARE) demonstrated that kinetic energy weapons can destroy warheads not only with a perfect hit, but also by inflicting damage with a less-than-perfect collision. ARE demonstrated the process of self-destruction of a damaged warhead as it enters the atmosphere.

With directed energy experiments, researchers have demonstrated several key principles related to the operation of a large Free Electron Laser, a weapon which could become powerful enough to destroy enemy ballistic missiles in the boost and post-boost phases of flight. The Free Electron Laser has demonstrated lasing which shows wavelength scaling beyond that needed for an operational defense system. Also, for the first time, a major milestone was achieved when the Alpha Chemical laser recently produced a high-power beam in a simulated space environment.

The March launch of "Delta Star" continued the success of earlier experiments which demonstrated substantial improvements in our ability to develop sensors necessary for strategic defenses. Last Year's DELTA 181 experiment provided valuable information on the signatures of midcourse targets. The assortment of active and passive sensing instruments accurately characterized the test objects in a variety of space environments and also observed the launch of a research rocket. This data is

being used to develop effective algorithms for discrimination between decoys and reentry vehicles.

Our program schedule for the next two years includes a number of very important tests and experiments. All are fully compliant with U.S. treaty obligations. A few upcoming projects and experiments and their contribution to the research program are highlighted below.

<u>EXPERIMENT</u>	<u>OBJECTIVE</u>
Beam Experiment Aboard Rocket (BEAR)	First test of a Neutral Particle Beam in space.
Laser Atmospheric Compensation (LACE), Relay Mirror Experiment (RME)	Space test of relay mirror and atmospheric compensation process for ground-based free electron laser.
STARLAB	Space test of tracking/pointing, sensor and communications technologies.
Space Power Experiment Aboard Rocket (SPEAR) II	Space test of high power electricity applications.
Airborne Optical Adjunct Infrared Experiment	Airborne test of LWIR sensor.

The Report to Congress on the SDI program contains additional information regarding upcoming SDI experiments, including their compliance with the ABM Treaty. As has been the case since the program's inception, planned tests and experiments for fiscal years 1990/91 are in full compliance with the ABM Treaty. All planned activities are reviewed in detail by the Department of Defense Compliance Review Group to ensure such compliance. This review process is a deliberate, vigorous study of plans and treaty considerations.

I would like to touch briefly on one other item before closing. As you are aware, the SDI research involves our

Allies. President Reagan's original guidance and SDIO's charter reflected a concern for both U.S. and Allied security and stressed the development of defensive technologies for ballistic missile threats of all ranges. Several Allied nations are actively participating with valuable technical contribution to the program. The anti-tactical ballistic missile program, conducted with Allies, will include analyses, technology developments, and experiments that will improve our understanding of the theater defense problem.

Allied participation in SDI research - increasingly rich in technical merit through rigorous competition - is of great benefit to the United States as well as the participating nations. Allied participation contributes to the timely attainment of SDI objectives with work of the highest quality performed at the lowest possible costs. We will continue to cooperate with our Allies on many aspects of the SDI research program.

CONCLUSION

Tangible, impressive results from our research efforts have given us increased confidence that strategic defenses are feasible. Our progress has been excellent, but we still have much left to do. The amended budget request for fiscal years 1990/91 will enable us to maintain the necessary balance between research on Phase I and follow-on technologies in order to provide the technical foundation for a viable SDS option. A reduced appropriation would degrade our ability to maintain that essential balance of research, and remain on track to provide strategic defense strategy options in the 1990's.

Robust, undistributed funding is required to maintain both program flexibility and responsiveness. A research program as innovative and dynamic as ours cannot afford, in a technical sense, to be constrained by fences or inflexibility. Much in

the same manner a battlefield commander needs the freedom to use his resources and to seize opportunities, the SDIO manager needs the flexibility to fund high payoff technologies - ones that will keep our program on track to fulfill our objectives.

I will be happy to answer any questions you may have.

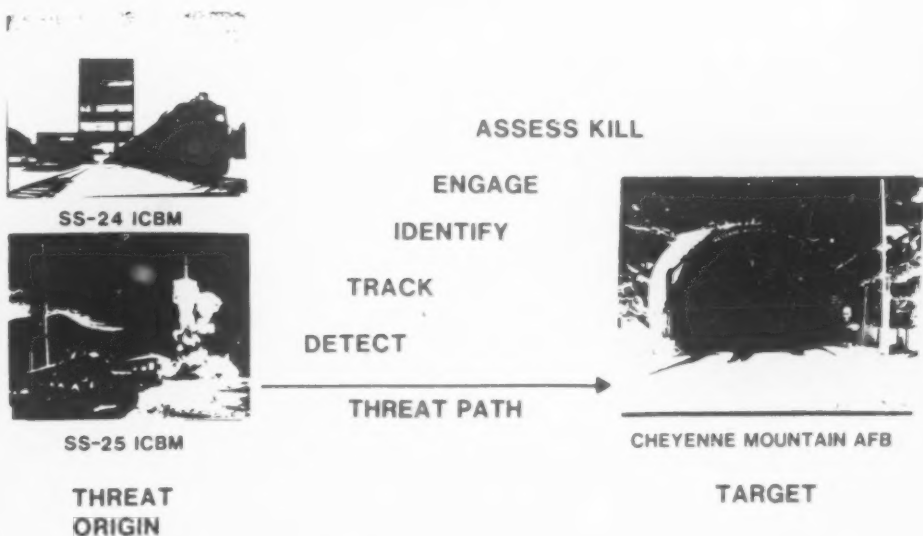
Senator EXON. Thank you, General Monahan.
General Piotrowski.

**STATEMENT OF GEN. JOHN L. PIOTROWSKI, U.S. AIR FORCE,
COMMANDER IN CHIEF, U.S. SPACE COMMAND**

General PIOTROWSKI. Mr. Chairman, I have provided a written statement, and if I may proceed—

Senator EXON. That will be accepted in full without objection for the record.

DEFENSE FUNCTIONS



General PIOTROWSKI. What I would like to do now is talk about how the operator would view the operation of such a system. And quite frankly, I have a great deal of confidence in our ability to eventually perform the function of ballistic missile defense, based on the experience that we have at Cheyenne Mountain today in doing the detection, tracking, and identification of a ballistic missile threat. What we do not do today is engage and do assessment of how effective our engagement systems are. So these are the things that need to be done, and we already do three of them and we do them quite a bit.

[Slide deleted.]

And what I am talking about, of course, is if a ballistic missile were launched from a Soviet or Third World country anywhere in the world, we have a system, the Defense Support Program, that detects launcher, [deleted].

[Slide deleted.]

We have a lot of experience with that. And what we are doing, as Senator Nunn suggests, is that we have a man in the loop. [Deleted.]

There are operators at each one of these locations, and a ballistic missile launch looks [deleted].

When the operator at that ground station receives that data from the satellite, looks at it and says, I believe that this is really a launch, he sends that information to the Missile Warning Center in Cheyenne Mountain. So we have human intervention at the ground site validating that data.

Then, subsequently more information comes from the satellite. It is processed on the ground and we get finer data. Subsequent to that, of course, the radars that are around our northern periphery would see the missile in flight and give us much finer-grain data.

[Slide deleted.]

We have averaged over [deleted] events per year. When the operator sees the indication of a ballistic missile launch on the scope and validates that his satellite is good, he sends the data forward—we call this a quick alert. And the average time for receipt of that data in my headquarters is [deleted]. That is with human intervention.

If we took the human out of the loop [deleted].

[Slides deleted.]

Now, shortly thereafter and in fact [deleted]. And that appears on our scope much like this: it tells us that [deleted] were reporting on this launch, tells us the time, where it came from, tells us [deleted].

[Slide deleted.]

Well, how often do we do that? How often do we see that? In 1987 and 1988 we saw [deleted]. So the system is used frequently. Well, somebody asked me once, do you do no-notice tests? I do not have to. [Deleted.]

[Slide deleted.]

So we have a lot of experience with that system. Well, that is the basis then of looking at the equipment that General Monahan talked about, the Phase I deployment.

[Deleted.]

[Slide deleted.]

Now, this is the responsive threat. [Deleted.]

So I am not saying that this is not a valid responsive threat. I am just saying it is a very tough threat, and I do not think it could get any tougher than that. That is as good as the Soviets are going to be able to do. They could add more warheads, but they are going to have to take more time, and time is what is more important.

[Slide deleted.]

What that looks like is, this orange line is the boosters in flight. The yellow line is the post-boost vehicles with the RVs clustered on them if it is a multiple warhead system coming off. And the red line is the individual re-entry vehicles coming off of that. [Deleted.]

The value shooting soon after launch at these booster vehicles with the space-based interceptor is to thin the attack as much as we can.

[Slide deleted.]

[Deleted.]

Then the DSP would give us a missile event message. We would have national systems also telling us that things were going on.

[Deleted.]

I am confident that, based on the experience we have with thousands of missile launches, that [deleted].

[Slide deleted.]

[Deleted.]

Now, let me try that slightly differently.

[Slide deleted.]

Here again in orange are the boosters in flight, the post-boost vehicles with warheads, and then the individual warheads. And the same color applies here; these are boosters, post-boost vehicles, individual RVs, as they fan out.

This shows when they start being tracked. The hashed line here shows that I could defend much earlier than I anticipate in a "bolt out of the blue," because I have got to analyze the attack, decide what strategy, and make sure of the attack. And so I assume that my engagement decision would take place here.

And in just a few seconds after the decision is made, [deleted]. I am going to be engaging boosters.

Now, if I could talk about the [deleted].

So a lot of these ballistic missiles are not going to get through. The space-based engagement is going to thin the Soviet attack. [Deleted] refine that decision so that we have the highest probability of kill against that.

[Slide deleted.]

[Deleted.]

[Slide deleted.]

I would like to talk just a little bit about the nature of the threat. Nobody does anything friendly in the way of missile launch out of the ocean, and certainly if the Soviets are going to mount a coordinated attack it is going to be both SLBMs and ICBMs, with the [deleted].

Nobody does anything friendly out of the ocean. Nobody launches satellites out of the ocean. Nobody launches passenger flights out of the ocean. For anything coming out of the ocean toward the United States, [deleted].

And oh, by the way, how about mistakes? [Deleted.]

[Slide deleted.]

Then of course, the threat, along with the SLBMs, would be the ICBMs coming out at the land-based targets. And the Soviets are not going to attack with one or two missiles. There is going to be a massive launch. Our detectors, like the DSP and the BSTS, are going to see that. There is not going to be any doubt about that.

And when we confirm that with our national systems, there is not going to be any question that there is an attack here, especially if it is coordinated with a sub-launched attack. And again, you cannot defend against something that is not there.

[Slide deleted.]

Now, this simple graph shows that [deleted]. But as you move across the spectrum from peace to war, from nirvana to Armageddon, and you get in a position where there are theater conflicts, tactical nuclear weapons going off, where strategic forces of the Soviet Union have been deployed, they have gone mobile, rail, out on the tracks, then we are going to be leaning forward, anticipating that launch, and [deleted].

I am confident that if General Monahan builds the systems that he is working on now and this Nation makes a decision to deploy, we can defend effectively against a ballistic missile attack, whether it comes from the Soviet Union or a Third World country.

BOTTOM LINES

- **EARLY ENGAGEMENT OPPORTUNITIES ARE DRIVEN BY RULES OF ENGAGEMENT**
- **THE PENALTY FOR ENGAGEMENT DELAY IS SIGNIFICANT**
- **AT THIS TIME, WE BELIEVE THE DECISION TIMELINES AND WEAPONS ASSIGNMENT PROCESS FOR BMD ARE NOT DIFFICULT**
- **WE WILL UNDERSTAND THESE FACTORS EVEN BETTER AS WE TEST, EVALUATE, AND EXERCISE BMD CONCEPTS IN THE NATIONAL TEST FACILITY**

And our opportunities to defend, of course, are driven by rules of engagement, and I think that those will not be difficult to come up with. The penalty for delay is significant.

I do not believe that the decision time lines are stressful. I think that the systems that we have today demonstrate that, and people are beginning to understand BMD timelines a lot better as we exercise, evaluate, and simulate the various capabilities that we are getting in the national test facility.

Sir, I would be pleased to answer any questions you have.
[The prepared statement of General Piotrowski follows:]

Testimony

General John L. Piotrowski, USAF

Mr. Chairman, distinguished Committee members, thank you for the opportunity to appear before you today in my capacity as the Commander in Chief of the United States Space Command and to share with you my views on a critical missing link in our strategic defense posture--ballistic missile defense.

The essence of my testimony today is straightforward. Having analyzed, from an operational perspective, the military requirements of the Joint Chiefs of Staff, the Soviet reactive threat of the Defense Intelligence Agency, and the Phase I ballistic missile defense architecture of the SDI organization, I now believe that the proposed Phase I ballistic missile defense system can be operated to meet or exceed the JCS-established requirements.

Since its formation in 1985, the United States Space Command has had a broad ballistic missile defense planning mission. In December 1987, I was tasked by the Chairman of the Joint Chiefs of Staff to develop a concept of operations for the Phase I ballistic missile defense system. My marching orders were simple: Support the acquisition process by developing a ballistic missile defense concept of operations based upon a validated DIA threat, the JCS-established requirements, and the SDIO's Phase I ballistic missile defense elements. The concept of operations, which was approved by the JCS for further planning earlier this year, is a baseline document describing how the operational commander would employ a Phase I BMD system. A refinement of this concept of operations, which was necessitated by the restructuring of the SDIO's initial architecture in October 1988, will be delivered to the JCS later this summer. Detailed planning annexes are being developed to provide specific descriptions of operational

guidelines, operational support concepts, transition planning, and specific operational requirements. The end result will be a family of operational planning documents to support DOD's acquisition process and provide the research and development community with an operational perspective. Such a perspective is essential throughout the ballistic missile defense research and planning community if operationally feasible deployments are to occur.

Largely in support of our concept of operations development, United States Space Command has analyzed both the technical characteristics and the timelines under which it must operate in terms of broad operational defense functions. This approach enhances the development of realistic operational requirements for the research and development community, while providing a warfighting perspective to the planning community at large.

We're convinced, at this time, that ballistic missile defense can be done operationally. Furthermore, the decision timelines and weapons assignment process for ballistic missile defense do not appear overly difficult. Although the timelines for BMD are relatively short and stressing, many of the air defense timelines we have in Europe today are much shorter and more demanding than those a commander would face defending against a Soviet ballistic missile attack. Key to the overall effectiveness of a Phase I BMD system is the leverage gained from engagement in the boost and post-boost phases of flight. This is driven largely by rules of engagement. If the commander is given rules of engagement that support a controlled but rapid response to ballistic missile attack, the Phase I architecture can be operated to meet or exceed the JCS requirements. We will understand these factors even better as we test, evaluate, and exercise BMD concepts of operation in the National Test Facility at Falcon Air Force Base.

If the decision is made to develop and deploy a Phase I BMD system, the deployment process must naturally include procedures for integrating these future systems with existing elements of the tactical warning and attack assessment system. The Air Force System Integration Office in Colorado Springs has developed an initial transition planning concept for this integration. While more planning needs to be done in this area, it's apparent that any such transition must be accomplished incrementally. Just as the Phase IBMD architecture cannot be deployed overnight, our existing space and ground-based warning system cannot be replaced overnight. The community's planning efforts for integration are underway and will continue as we prepare for a development and deployment decision.

The effective integration of a future ballistic missile defense into our Nation's existing warning and command and control system requires a mechanism to assess development and deployment concepts. That mechanism is the National Test Facility (NTF). The National Test Facility will provide the end-to-end simulation framework to test and wargame various technical combinations, operational concepts, and command and control structures. United States Space Command is a major user of this facility. We've already conducted ballistic missile defense wargame simulations at the NTF and are planning more. The NTF has a large role that includes the testing and evaluation of architecture and element design trade-offs, element performance analysis, and the evaluation of concepts of operations via wargaming and simulation.

United States Space Command's role in ballistic missile defense planning continues to grow. In addition to the close planning relationship with the JCS and SDIO, we are also coordinating our BMD planning efforts with the other unified and specified commands. In this regard, our interface with the Strategic Air

Command is particularly important in the offense-defense coordination arena. The Joint Strategic Defense Planning Staff at United States Space Command Headquarters has taken initiatives to ensure that our strategic offensive and defensive capabilities will be fully cognizant of each other's activities and plans. Coordination between offensive and defensive forces in planning and execution will enhance the military effectiveness of both.

You also should be aware that future ballistic missile defense deployments would greatly enhance our ability to make required improvements to United States Space Command's tactical warning, space surveillance, and space control systems. The spin-offs from SDIO's emerging technologies available to defeat a ballistic missile attack will greatly improve the performance of current United States Space Command missions.

In summary, the United States Space Command is actively involved in operational assessments of the technology options provided by the SDI Organization. Lt Gen Monahan and I have a close working relationship in this regard. Furthermore, as directed by the Joint Chiefs of Staff, United States Space Command is performing the operational planning activities to support an informed decision whether to develop and deploy a ballistic missile defense system. Given suitable rules of engagement, a Phase I ballistic missile defense can be employed operationally to meet or exceed the JCS requirements. Thank you, Mr. Chairman. I'd be happy to answer your questions.

Senator EXON. I thank both of you.

I will ask the timekeeper to keep the usual time and we will move right along.

PHASE I

I listened with great interest to what is going on here. How many years down the road from now, if we began to deploy Phase I, would we have any reasonable assurance of killing one or two missiles launched either by terrorists or accidental launches?

I mean, could we be reasonably assured about that by when? Before the turn of the century?

General MONAHAN. [Deleted.] But the current funding level with the \$33 billion program over the period of the next 5 years, and if we keep, we still proceed with the Phase I of the program, and particularly the ground-based portions of it [deleted].

Senator EXON. And with that, we would have reasonable chance that onesies or twosies or an extremely limited attack could be killed?

General MONAHAN. Yes, we clearly would have that kind of capability.

Senator EXON. Now let us move forward and let us assume that we are fully finished with Phase I. [Deleted.]

General MONAHAN. [Deleted.]

Senator EXON. Now, do we have any contemplation at the time as to how we would select or how we would attempt to kill particular incoming missiles? Just for an example, would we attempt to kill [deleted] percent of them aimed at our retaliatory force and the other [deleted] percent aimed at our city or other targets?

Or is any consideration given to that?

General PIOTROWSKI. Let me answer that if I may, Senator. The first thing [deleted]. It is not an operational dictate. So the answer to your question is that if there are [deleted] and thin that attack.

Given no other requirement or given that requirement and one other, what you would want to do is destroy the boosters that had 10 RVs on them and get the leverage that you get in the initial space-based defense.

So the way we would use those [deleted]. And anything the Soviets do not launch initially, then General Chain and Admiral Hardisty and Admiral Kelso are going to kill in the silos with their retaliatory forces.

So the answer is we will use preferential defense as given to us by the President, by the Secretary of Defense, and we will thin the attack to the best of our ability against the most threatening boosters.

DETERRENCE

Senator EXON. The defense of our cities is obviously important—I would not want to write those off. But it always seems to me, despite the statements of the previous administration, including the Secretary of Defense that if you are talking about deterrence, we should convince the Soviets that we would defend at least a sizable portion of our retaliatory force. This, to me, would be the strongest deterrent.

General PIOTROWSKI. [Deleted.]

Senator EXON. [Deleted.]

General PIOTROWSKI. [Deleted.]

So I agree with you that it is a question of what this Nation decides that they want us to do. We can do that.

Senator EXON. So what you are saying is that the programs are being so designed and that later on the determination would be made as to what we would protect?

General PIOTROWSKI. Yes, sir. And I do not see any limitations to be able to do exactly that and to alter it as the attack is coming.

Senator EXON. My time is up on the first round.

Senator WALLOP.

Senator WALLOP. Mr. Chairman, I want to thank you for this hearing. I want to thank both General Piotrowski and General Monahan for what is finally becoming in the realm of conceptual reality. It really is very reassuring to have these briefings.

I would say to the Chairman, one of the answers to his first question is that we have never really developed the option, because we have never had a weapon. It has been pretty impossible for us to make conceptual advances without anything solid enough to base it on.

REDESIGNING THE SDI PROGRAM

General Monahan, let me ask you this. If you could redesign the SDI program to meet the President's objective without the encumbrance of the ABM Treaty, what would it look like? I think it is important for the President to know and the committee to know. I do not realistically suppose that we will have that option.

General MONAHAN. If we went back perhaps about 3 years, maybe 4 years ago, you really would have had that kind of opportunity. As it stands at the present time, the elements that I described up there are in the demonstration/validation phase. So their path has been set. Contracts have been awarded, 28,000 people are at work going in a certain direction, which is within the restrictive interpretation of the treaty.

It is very difficult for me to visualize, if I did not have to live with that today, how might we alter, where might we go. I think perhaps we might accelerate some tests. I do not really know for sure. It's difficult to say, given the circumstances where we are now.

Senator WALLOP. But the interesting part of your response is that 3 years hence we could be where we are today if we do not begin to make those judgments. In other words, 3 years ago a judgment has constrained you and directed 28,000 people to do things which are not nearly so effective or demonstrative as they might have been had those decisions not been made.

So each year that passes postpones the moment in time where you can get to that. I think it is important somehow or another that this become part of the conversation as to what could we do now to get ourselves ready were we not to be constrained, because as I looked at your charts that you put up, each of them had been slipped a little bit, partly by constraints of budget, but more often by constraints of the inadequacies of a testing regime which did not give you answers as quickly as might have taken place.

General Piotrowski, I really compliment you on the briefing, the testimony on how we are beginning to plan for the introduction of strategic defenses into our whole defense complement. So finally it looks as though it may even be able to justify the word "defense" being part of that.

You mentioned in your testimony, your written testimony, interface with the Strategic Air Command is particularly important in

the offense-defense coordination area. And you also mentioned that these interactions were the initiatives of your Joint Strategic Defense Planning Staff at Space Command.

Could you give us a description or a little bit more detail of what is entailed in your interaction with SAC, and are you pleased with the interaction of SAC and JSDPS offices?

General PIOTROWSKI. Yes, sir. Let me answer the last question first. I could not be more pleased. General Chain and his staff have been very forthcoming in working with us. We have a very close relationship. We are personal friends and that always helps.

Moreover, he recognizes the contribution that defense can make. We talked about the adaptive defense of Peacekeeper missiles, whether they are on the railroads or whether we are defending silos or giving him a little bit more time to get his bombers airborne or whatever, surviving his command and control so he can get the message out coming from the President.

So he is very appreciative about the contribution BMD can make to his forces, which is the thing that we are looking at principally—and we have had a lot of people tell us that there is not a problem; that is the good news. But until I am absolutely certain that there is no conflict, and the Soviet missiles are coming at the same missile fields that he is launching out of and they are coming at his bomber bases, our early space-based system is not going to cause a problem. But the ERIS and HEDI defenses of those systems could cause nuclear detonations if the Soviets salvage-fuse their warheads, which they could. Then in fact we could have nuclear detonations where those interceptors meet those incoming re-entry vehicles. And his missiles——

Senator WALLOP. My time has expired, I see.

Senator EXON. Go ahead.

NUCLEAR DETONATION

Senator WALLOP. If I could make just one small side tour, how is the nuclear detonation likely? That would require pre-programming, would it not?

General PIOTROWSKI. No, sir. It would require a sensor on board that says, I have been hit.

Senator WALLOP. Okay.

General PIOTROWSKI. [Deleted.] Additionally, we do not think that space is going to be concurrent, that is, U.S. and Soviet missiles will be juxtapositioned in the same space.

[Deleted.] And of course, we reduce that problem and we increase our defense capabilities by getting more systems into space, because if we can attack their boosters with the 10 to 1 leverage, we get tremendous defensive effectiveness while reducing the number of warheads in flight toward our outbound missiles.

Senator WALLOP. Thank you.

Senator EXON. Thank you.

Senator Wilson.

Senator WILSON. Thank you, Mr. Chairman.

Gentlemen, you have provided a remarkable afternoon, I think. And General Monahan, you certainly answered my question with your chart. You indicated that to fully go forward with testing and

deployment required to implement Phase I would require an [deleted] did I understand?

General MONAHAN. In that area, yes, sir.

Senator WILSON. That general area.

General Piotrowski, that is a remarkable briefing, and I must say from the standpoint of the user, when you state, as you have, that it is with confidence that you anticipate being able to achieve an implementation that would allow you to engage within the time frame, that allows destruction of either the booster or destruction of enemy re-entry vehicles before they are launched on an independent single trajectory, I must say that gives me great confidence that this first phase system has enormous value in achieving the stated goals of so discouraging a rational Soviet war planner as to make the notion of a first strike an irrational notion.

That is all good news. And I go back to the statement contained in the classified testimony of the Vice Chairman, General Herres, that there is full confidence in being able to do this first phase, but that it is predicated upon our not shorting the funding and the commitment that is asked for by the President.

I was required to get out of the room and I do not know whether some of my colleagues may have asked, but I think that we need to know what the consequences would be in terms of shortfall, in terms of our inability to achieve either that IOC or that level of confidence, if you are cut in funding in specified amounts. Could you provide that for us for the record?

General MONAHAN. We could provide that, Senator Wilson.

Senator WILSON. Because I mean, that is going to be the critical question.

General MONAHAN. Yes.

Senator WILSON. When we get to the authorization and the appropriation.

Senator EXON. I think that is a very good idea, Senator Wilson. For example, if SDI was funded at full, that is what you have; funded at 90 percent, 80 percent, 70 percent. Something like that, is that what you were thinking of, Senator Wilson?

Senator WILSON. Yes, sir.

General MONAHAN. Sir, we can do that.

[The information follows:]

SDI INFORMATION PAPER

The current program is structured to permit a deployment decision by the President within the next 4 years. It anticipates total funding of \$4.6 billion in fiscal year 1990 and \$33 billion across the 5-Year Defense Program (FYDP). The program goals remain the same as those formulated under the prior administration's budget and, therefore, the general framework of the program is unchanged;

Pursuit of both space- and ground-based defenses;

Continuation on the path to deployment of a system that meets JCS requirements for a Phase I Strategic Defense System;

Close adherence with the deployment schedule presented to the Congress with the January 1989 FYDP; with

Flexibility to adjust the program as technology is tested and proven.

Near term efforts focus on evaluating the potential of the most rapidly advancing technologies. In particular, evaluation of the Brilliant Pebbles concept is emphasized.

The current budget is substantially less than the January 1989 fiscal year 1990/1991 (Reagan) request which was based on funding of \$5.6 billion in fiscal year 1990

and \$40.6 billion across the FYDP. Funds now requested are the minimum needed to meet the goals established for the SDI by the President.

As outlined on the following pages, each incremental funding reduction from the current budget would have increasingly serious consequences. The items most affected would be:

- The timeliness and choice of options for a deployment decision;
- The development and validation of advanced concepts for follow-up Phases; Allied support; and
- Leverage the SDI program provides in arms control negotiations.

Since follow-on systems will have to be deployed in a timely fashion to offset possible Soviet countermeasures to initial defenses, it is important that initial and follow-on phase efforts remain appropriately balanced. Budget reductions from current levels may force both a delay in projects supporting an initial phase of a future Strategic Defense System, but an even longer delay in projects which support follow-on systems. This outcome could force a major redirection of the program.

The impact of successive budget reductions would also produce increasingly serious damage to the SDI program infrastructure. Efforts of past years have coalesced technology into identifiable initial strategic defense system elements and architecture (i.e. a Dem/Val program), and several ground-based and space-based follow-on element concepts. To capitalize on this progress we have awarded many multi-million dollar, long term contracts, and established appropriate program offices. Even at the 90 percent level, the SDI infrastructure will be affected. Additional costs due to program stretch-out will be incurred, contracts will be renegotiated or terminated, layoffs will occur of personnel hired in anticipation of a funding increase in fiscal year 1990, and skilled scientists and engineers will be lost from the research project.

Although decisions on specific program cancellations/slowdowns and contract terminations/renegotiations will require additional study, the table at the end of this report lists most major SDI programs and primary contractors, and identifies the possible outcomes at each funding level.

Regardless of the SDI budget level approved, it is crucial that SDIO have the flexibility to adjust funding among the various programs and not be constrained by "fences" imposed by the Congress. SDI is still evolving, many technologies are developing rapidly, and international conditions cannot be confidently predicted. Changes may require the reordering of SDI program priorities and reallocation of available funds in order to attain program objectives and maximize the contribution of the SDI to National Defense.

The following impact assessments assume that the 10, 20 and 30 percent reductions are applied to each year of the FYDP.

IMPACT TO PROGRAM IF FUNDED AT 90 PERCENT OF CURRENT REQUEST—(\$4.1 BILLION)

An informed decision on deployment may not be possible within four years. Reduced funding would bring about a lower level of research in technical risk, cost reduction, and key technology areas. Planned research in these areas is critical for a confident decision.

A delay of up to one year for the deployment decision can be expected, with corresponding delays for development and deployment schedules.

Some U.S. Terminal Interceptor (including the Anti-Tactical Ballistic Missile) research may be canceled and Allied testing and participation would, therefore, be limited.

A number of experiments critical to proving important technologies would be delayed or canceled.

Directed Energy and Advanced Technology programs would be slowed to the point where follow-on systems may not be available in time to offset possible Soviet countermeasures to an initial U.S. strategic defense system.

The national workforce currently planned for fiscal year 1990 SDI research may be reduced by more than 3500 personnel.

IMPACT TO PROGRAM IF FUNDED AT 80 PERCENT OF CURRENT REQUEST—(\$3.6 BILLION)

The likelihood of making a deployment decision within four years would be further reduced due to an even lower level of research in technical risk, cost reduction, and key technology areas. For example:

- Fewer flight tests of interceptors and sensors and ground simulators.

- Cancellation or up to three year delay of vital survivability and hardening measures.

Slowing of advanced materials program. This will affect the quality of estimates on producibility, manufacturing costs, life cycle costs, and life duration.

Emerging concepts, especially Brilliant Pebbles, would not be fully explored.

The space architecture could, therefore, not be completely defined.

Additional U.S. Terminal Interceptor (including the Anti-Tactical Ballistic Missile) research may be canceled and Allied testing and participation would, therefore, be further limited.

Directed Energy and Advanced Technology programs would remain in the laboratory as the more expensive technology integration experiments would be unaffordable.

Follow-on systems would not be available in time to offset Soviet countermeasures to an initial U.S. strategic defense system.

Initial system development/deployment schedules would be delayed at least two years.

The national workforce currently planned for fiscal year 1990 SDI research may be reduced by more than 6000 personnel.

IMPACT TO PROGRAM IF FUNDED AT 70 PERCENT OF CURRENT REQUEST—(\$3.2 BILLION)

This funding level could not support the research and testing needed to make an informed deployment decision within 4 years.

U.S. funding for most Allied cooperative programs would be terminated.

If we are to continue development of layered defenses that meet JCS requirements, Directed Energy and Advanced Technology programs for follow-on systems would have to be canceled and/or minimally funded.

All aspects of the program would be fund-limited, rather than free to advance at the pace technology is developed.

An initial deployment would be delayed until well after the year 2000, with no provision for follow-on systems to offset Soviet countermeasures to the initially deployed system.

The national workforce currently planned for fiscal year 1990 SDI research would be reduced by more than 8000 personnel.

POTENTIAL IMPACTS TO SDI PROGRAMS AT VARIOUS LEVELS OF TOTAL FUNDING

PROGRAM	CONTRACTOR	90%			80%			70%		
		or		Cancel	or		Cancel	or		Cancel
		None	Slow		None	Slow		None	Slow	
Boost Surveillance & Tracking System	Crumman, Lockheed	X			X			X		
Space Surveillance & Tracking System	Lockheed, TRW	X	X			X	X	X	X	
Ground Surveillance & Tracking System	McDonnell Douglas	X	X		X	X		X		
Ground Based Radar	Raytheon	X	X		X	X		X		
Command & Control	General Electric	X	X			X		X		
Space-Based Interceptor	Rockwell, Martin Marietta	X	X		X	X		X	X	
Brilliant Pebbles	(not determined)	X	X		X	X		X		
Exoatmospheric Interceptor (FRIS)	Lockheed	X	X			X	X	X	X	
Ground-Based Interceptor	(not determined)	X	X			X		X		
Endoatmospheric Interceptor (HEDI)	McDonnell Douglas	X	X			X	X	X	X	
Alcornoque Optical Adjunct	Boeing	X	X		X	X		X	X	
National Test Bed	Martin Marietta	X	X			X		X		
Extended Range Interceptor	LTV		X	X		X	X	X	X	
ARROW Missile	Israel	X	X		X	X		X	X	
Tactical High Altitude Area Defense	(not determined)	X	X			X		X	X	
Chemical Laser	Martin Marietta, TRW		X			X		X	X	
Free Electron Laser	Lockheed, TRW, Boeing		X			X		X	X	
Neutral Particle Beam	Crumman, Boeing, Westinghouse, SAI, McDonnell Douglas, approx 15 others		X			X		X	X	

Although decisions on specific program cancellations/slowdowns and contract terminations/re negotiations will require additional study, this table lists most major SDI programs and primary contractors, and identifies the possible outcomes at each funding level.

Senator WILSON. And I think too you might provide us not only that, but there is a temptation sometimes on the part of people to second guess specific elements of the system and engage in a little micromanagement and try what they would regard as not a meat axe, but surgery. So it may be that it will come out at the same place if you identify costs by element.

General PIOTROWSKI. We will work together on that, sir.

General MONAHAN. If I may, sir, when we revised the budget and took the \$1 billion out of the program for fiscal 1990, \$8 billion over the 5-year period, we looked at a number of options. And you can see what finally came out here.

Most everything slips here by a period of about [deleted]. And to go below that and still maintain the directed energy program, the kinetic energy program, the infrastructure program, including the command center, sensors, something in there is going to have to give.

Senator WILSON. Mr. Chairman, in light of General Monahan's response, I think that it would be not just desirable but essential for the committee to have an intelligence briefing that projects what we can anticipate by way of progress on the Soviet side, so that we are able to match the level of progress as impacted by our own budget decisions against what is happening on the other side.

Senator EXON. I am advised that we do have that scheduled. When is that scheduled? Is that date fixed?

(Pause.)

We had the one over there. We do not have another one before markup, do we?

VOICE. No.

Senator EXON. And I do not see how we could—with our schedule, I think it would be difficult. We did have that briefing which General Piotrowski was in for, what, 10 days, 2 weeks ago?

Senator WILSON. I will have to make that up on my own. Mr. Chairman, I commend you for having held this hearing and the one that I missed. I really think we have to juxtapose the kind of information that we just requested from Generals Monahan and Piotrowski with whatever unfolded in that presentation, so that we have in pretty sharp relief the knowledge of what we will do if we engage in budget cuts that have any serious impact upon the scheduled implementation of the first phase.

Senator EXON. The suggestion was made by staff, which is a good one, as long as you are doing this assessment, to give us what happens to the program at a \$3.1 billion level, which is one of the suggested marks on the House side. And if you could get this back to us as quickly as possible it would be most helpful. We are going to markup relatively soon.

General MONAHAN. We will do that, Mr. Chairman.

Senator WILSON. Thank you, Mr. Chairman. and I really want to thank General Monahan and General Piotrowski. It has been an extraordinary presentation.

Senator EXON. Generals, I also add my thanks along with my colleagues' to this very interesting presentation, and most informative briefing you gave us today.

Have you received any new or updated national security directive on the SDI program from the new administration yet?

General MONAHAN. None has been issued to us at this time, Mr. Chairman.

Senator EXON. Are you expecting to receive any results of the strategy review? If so, how soon?

General MONAHAN. I do not really have a timetable for that as of the present time. I expect that sooner or later we will perhaps have an NSD—

Senator EXON. Can you tell us anything about any of the SDI directives that have been discussed or may be coming down the pike?

General MONAHAN. No, I could not, Mr. Chairman.

Senator EXON. Gentlemen, thank you very much.

Do you have any further questions, Senator Wallop?

Senator WALLOP. Mr. Chairman, I have two, but I think they are relatively simple and I do not wish to burden people with extra paperwork, relatively simple to respond to in writing.

Senator EXON. Fine.

With that then, we thank you again, and there will be additional questions for the record. And we are adjourned.

[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR J. JAMES EXON

PHASE I SDI

Senator EXON. General Herres, the committee has been assured on several occasions that the Phase I SDI would not enter FSED (Milestone 2) until the more exotic systems like lasers and particle beams had passed their Milestone I tests, so we could be sure that the follow-on systems designed to produce "highly effective" defenses were at least technically feasible. Is this still the DAB's position, or are we now disconnecting Phase I Milestone decisions from the Milestone decisions for follow-on, exotic technologies?

General HERRES. In February and again in November 1988, the Defense Acquisition Board (DAB) directed that the SDS Phase II shall undergo a Milestone I review at least 90 days prior to the Milestone II for SDS Phase I. What this means is that the DAB will review promising SDS Phase II weapons elements (e.g., space-based lasers, neutral particle beams, etc.) and competing systems concepts to determine whether a system concept has been adequately defined and can be selected for entry into demonstration/validation. This procedure allows the DAB to understand the progress made at that time in the development of Phase II technologies prior to making a recommendation regarding a full-scale development decision on the Phase I system.

I should point out that this procedure does not apply to the Milestone II decision points for our space-based warning and surveillance programs (BSTS and SSTs). These systems will have critical operational missions (attack warning and assessment) to perform no matter what the status of ballistic missile defense development might be, and it is expected that they may enter full-scale development before the Phase II effort is ready for a Milestone I review.

ARMS CONTROL POSITION

Senator EXON. General Herres, according to several news accounts, the Joint Chiefs were reported to have recommended to the President that we change our arms control position in Geneva; in particular, it is reported that the JCS recommended the United States no longer insist on an automatic right to deploy SDI at the end of an agreed non-withdrawal period from the ABM Treaty, although we could, of course, serve 6 months notice under the Treaty abrogation clause and then deploy SDI if we felt our supreme interests were jeopardized. Can you elaborate on the thinking behind this JCS recommendation?

General HERRES. Notwithstanding media reports, the Joint Chiefs of Staff do not challenge the right to eventually deploy ballistic missile defenses; it appears the reporters drew such conclusions on their own. On the other hand, there could be cause for concern if the current negotiating position is interpreted as predicting a withdrawal from the ABM Treaty at a date specified in the future. The Chiefs feel it would be more prudent to withhold the decision to withdraw until SDI proves feasi-

ble through research, development and testing, and remain within the ABM Treaty regime until a conscious decision is made to depart it, with full regard to political, fiscal, and strategic consideration that exist at that time.

FULL-SCALE ENGINEERING DEVELOPMENT

Senator EXON. General Monahan, I understand from answers to questions provided to a House committee that the total cost of Full-Scale Engineering Development for the revised Phase I system is now estimated to be \$28.8 billion. Is that the correct figure? Over how many years is that cost spread? Is that in constant or then-year dollars?

General MONAHAN. The estimate briefed in October 1988 for the Full-Scale Development portion (FSD) of the SDS Phase I is \$22.9 billion in constant fiscal year 1988 dollars, this figure is calculated over a 12 year period. SDS Phase I started with the Demonstration and Validation (Dem/Val) phase in the summer of 1987 and is not scheduled to begin a series of FSD decisions until fiscal year 1991 when BSTS enters FSD.

PHASE I SYSTEM

Senator EXON. What is your estimate of the date at which the complete Phase I system would be ready for a full, system-level FSED or Milestone decision? Will all the elements of the Phase I system have completed their individual Milestone 2 component reviews before that system-level review?

General MONAHAN. The SDI program is emphasizing technical risk reduction and cost reduction efforts on initial elements to support an informed decision by the President on the deployment of strategic defenses within 4 years.

BEAM WEAPONS COST

Senator EXON. The Center for Peace and Freedom recently quoted an estimate by General Abrahamson that a follow on phase of SDI with beam weapons would cost \$50 billion. Do your own estimates support that number? What costs are included in that estimate? Are the estimates in constant or then-year dollars?

General MONAHAN. Several alternative laser and particle beam weapon concepts are currently under study. To date there is insufficient technical, architecture and cost data to say with confidence whether a hypothetical late Phase of the SDS would cost more or less than the referenced "\$50 billion".

SDI PHASE I

Senator EXON. General Herres, SDI is, of course, of little use in defending against attack by airbreathing systems. For that reason, the Air Defense Initiative was created. Is the Air Defense Initiative progressing in phase with SDI Phase I, so that we would have both kinds of defenses ready to deploy at the same time? Will the Air Defense Initiative, as currently structured, be able to deal with the threat posed by low-observable, or stealth, aircraft and cruise missiles?

General HERRES. The Air Defense Initiative (ADI) is a research and development program managed and controlled by OSD, but executed within the Air Force, Navy, and DARPA. The program as currently structured is focused to address the mid- to long-term air threat to North America, specifically low-observable, and stealth, aircraft and cruise missiles, as well as SLCM carrying submarines. Although there is generally no question that such threats will appear in the future, intelligence estimates vary widely regarding when this threat to North America will materialize and become numerically significant. ADI has the ultimate goal of ensuring that the development of hostile airbreathing threats will not evolve beyond our capability to defend against them.

[Deleted.]

I believe the current efforts and the planned investment for the ADI program provide a well balanced approach to our future needs for strategic air defense whether or not we deploy ballistic missile defenses. I can assure you that SDI and ADI efforts are monitored jointly and are tied in such a way to ensure that the threat of the future and our military requirements can be dealt with in a balanced and effective manner.

AIR DEFENSE INITIATIVE (ADI)

Senator EXON. General Herres, what systems or technology does the Air Defense Initiative plan to use to detect and track stealthy aircraft and cruise missiles? By what date would you expect that threat to materialize? If we cannot defend against

stealthy cruise missiles, could this pose a potential threat to the successful operation of a Phase I SDI?

General HERRES. The Air Defense Initiative (ADI) is a technology development program which is managed and controlled by OSD and executed through the Air Force, Navy, and DARPA. In general, ADI is investigating several air surveillance technologies and undersea surveillance technologies, as well as engagement and battle management technologies to counter the potential stealth aircraft and cruise missile threat to North America.

[Deleted.]

I believe we need to be prepared to respond with deployment decisions, for a surveillance capability at a minimum, should the stealth threat begin to materialize. [Deleted.] There is generally no question that a stealth threat is inevitable. However, until more evidence becomes available, questions concerning the degree of signature reduction, when stealth threats to North America will be operational, and the expected numerical significance of that threat will be unanswerable. Therefore, we must conduct a reasonable and balanced effort to be ready. I believe that our current and planned ADI efforts provide such insurance.

Phase I SDS deployed without at least an air surveillance early warning capability to meet an atmospheric stealth threat would place much more at risk than successful operation of the Phase I system. [Deleted.]

SDI PHASE I ARCHITECTURE

Senator EXON. General Herres, to what extent does the Joint Staff independently analyze the proposed SDI Phase I architecture and the assumptions underlying it to establish its own quantitative judgment as to whether the proposed system will meet your requirements? Does the Joint Staff do that sort of detailed analysis and modeling?

General HERRES. The Joint Staff conducts independent analyses of the ability of the Phase I SDS architecture to meet the JCS SDS Phase I operational requirements on at least an annual basis. These analyses are conducted using computer simulation models of various levels of fidelity resident on internal Joint Staff computers. These analyses are conducted by military officers assigned to the Joint Staff and not contracted out. The results are briefed to the Joint Staff, the service Chiefs, and the Defense Acquisition Board (DAB) during the annual program review. The technical performance data of the SDS is provided by the SDIO for these reviews. Soviet weapons system performance data is provided by DIA using intelligence community positions. The Joint Staff developed the Phase I operational requirements and continues to remain engaged in ensuring that those requirements are met by the proposed system.

"OTHER PHYSICAL PRINCIPLES"

Senator EXON. Mr. Wolfowitz, at last October's hearing, we established that it will not be possible for the Department to provide the committee with an estimate of the potential savings to SDI of moving to the "broad" interpretation from the traditional, until the administration defines what is meant by "other physical principles." Has the administration come to a decision on the definition of "other physical principles" yet? When is such a decision expected?

Mr. WOLFOWITZ. There has been no decision as to the definition of the term "other physical principles." In any event, we do not see the likelihood of moving beyond the restrictive interpretation for a number of years, given the current structure of the SDI program. As we have made clear previously, we will define the best technical program for SDI, and if that program raises an issue regarding ABM Treaty interpretation, we will address it with Congress, considering the specifics of the proposed program on a case-by-case basis.

TWO-SIDED SDI WORLD

Senator EXON. General Herres, the Defense Science Board, back in April 1987, said that there should be an analysis of a two-sided SDI world before we could really decide whether to proceed. [Deleted.] As of last October's hearing, no such studies have been done. Has the Joint Staff conducted or is now conducting such studies? If not, why not? If so, when will the analyses be available?

General HERRES. The Joint Staff has not previously been able, nor has the entire SDS analytic community, to conduct two-sided analyses in a dynamic fashion. However, the Joint Staff has just recently developed a capability to conduct dynamic two-sided analyses. This capability is currently being tested as the Joint Staff con-

ducts a review of the operational requirements in preparation for the SDS Fall Defense Acquisition Board annual review. Following that analysis, other studies will be initiated to address the stability question. In regard to stability, it should be noted that currently the Soviets have a strategic ABM defense while the United States has none. This situation is not normally thought of as destabilizing. I do not believe that an appropriately designed and deployed Ballistic Missile Defense System would be destabilizing; quite the contrary, it may be a more stabilizing contributor to deterrence than some offensive system choices one might make.

MILESTONE TWO

Senator EXON. General Herres, at last October's hearing on SDI, General Abrahamson, on commenting on future decision points, said:

"the decision to go to even the development phase of a program is in the future. It is a Milestone Two decision, and it will be a very tough DAB that will be there and will, in fact, make that kind of decision."

Now Milestone Two is the full-scale engineering development Milestone in which, according to Dr. Costello at the same hearing:

"In Milestone Two, the program again faces approval or disapproval to enter full-scale development, in which production prototypes are defined and built."

The Congress has repeatedly been assured that prior to a Milestone Two, or FSED, decision, there would be "extensive consultations" with the Congress, precisely because that decision includes the development of production prototypes, which may be incompatible with the ABM Treaty. My question is twofold—is the administration still planning "extensive consultations with the Congress" before you make an FSED decision?

If so, why did the original fiscal year 1990 budget request contain an FSED budget line-item called "Phase I strategic defense system," if no such FSED decision has been taken?

General HERRES. I do not believe that it would be appropriate for me to speak for the administration on their plans to consult with the Congress. From the military perspective however, any funding for FSD would follow the normal acquisition process, and Congress does, of course, approve FSD funding. The fiscal year 1990 budget had a line-item for FSD long-lead items for the Boost Surveillance and Tracking System (BSTS) only. BSTS is the designated follow-on to our Tactical Warning and Attack Assessment (TW/AA) satellites, and TW/AA satellites (BSTS or otherwise) are required regardless of the status of the SDI program. General Monahan's schedule chart shows that FSD for weapons, command and control, etc., starts in the fiscal year 1994 time period.

MILESTONE TWO

Senator EXON. General Monahan, at last year's hearing, General Abrahamson referred to, and I quote: "The decision to go to even the development phase of the program is in the future. It is a Milestone Two decision." Yet you seem to be suggesting that there may be several Milestone Two decisions. Would you explain how multiple Milestone Two decisions is compatible with a single "informed decision," as General Abe used to say, to go to FSED, and how that is compatible with extensive consultations with Congress—if there's a whole series of Milestone Two decisions?

General MONAHAN. The SDI program is emphasizing technical risk reduction and cost reduction efforts on initial elements to support an informed decision by the President on the deployment of strategic defenses within 4 years.

REVISED PHASE I SYSTEM COSTS

Senator EXON. Your cost estimate of \$69 billion for the revised Phase I system presented to the committee last October was cost in constant dollars, wasn't it? What does the \$69 billion become in then-year dollars?

General MONAHAN. SDIO is reviewing alternative architectures and technologies that could result in the acquisition cost estimate being substantially reduced from \$69 billion (FY88). Phase I has just entered the demonstration and validation phase; it is at a very early stage in the acquisition process and cost estimates can change. We anticipate bringing the total acquisition cost of Phase I below \$69 billion. Every attempt will be made to work with the design of the system to meet mission requirements while staying within funding allocation.

SDIO is considering the Brilliant Pebbles in the context of a multi-layer architecture that would employ a ground-based interceptor tier to meet effectiveness requirements. Brilliant Pebbles is a technology program to provide research for an in-

egrated sensor and interceptor system. Brilliant Pebbles is judged to have a comparable effectiveness to other space-based interceptors against the present Soviet ballistic missile threat. Brilliant Pebbles offers other potential benefits such as low cost, survivability enhancements, and robust operation. SDIO is currently assessing the Brilliant Pebbles design, concepts, and related costs to meet performance goals.

WARHEADS FROM MINUTEMAN MISSILES

Senator EXON. In General Abrahamson's February 1989 "End of Tour" memo, he suggested a limited protection system which would remove warheads from Minuteman missiles based within 150km of the Grand Forks radar, and turn those ICBM boosters into ABM interceptor missiles by adding an ERIS-like front end. Is that the system SDIO would recommend if a decision were made to develop a treaty-compliant decision were made to develop a treaty-complaint limited protection system? What kinds of limited protection systems has the SDIO examined and evaluated?

General MONAHAN. The Department of Defense has no plans to develop a distinct and separate deployment option for an accidental launch protection system. The development of such an option would impose additional and unwarranted costs and could not meet the minimum defense capability which the Department of Defense requires to contribute meaningfully to deterrence and strategic stability. Moreover, the effectiveness of an accidental launch protection system would be significantly constrained by ABM Treaty limits. By contrast, the SDI program is developing deployment options which could maintain the strategic balance, deter attack upon the United States by adding ambiguity to the attacker's plans, provide some protection to elements of our forces, and, in the event of accident or that deterrence fails, limit damage to the United States and our allies.

SDI PROGRAM/RESEARCH OR DEVELOPMENT

Senator EXON. At the present moment is the SDI a research program or a weapons development program? At the present moment, is the Phase I SDS a research program or a weapons development program? Is the Milestone 2 (FSED) decision the appropriate point to consider that the Phase I SDS has become a weapons development program?

General MONAHAN. The SDI is currently a research program with all activities either in the concept definition or demonstration validation stages of R&D. The Milestone 2 (FSED) decision would be an appropriate point to consider Phase I SDS a weapons development program.

ADVANCED TECHNOLOGY DEVELOPMENT

Senator EXON. Your acquisition cost estimate for, Phase I is \$69 billion. In addition to that figure, what is the total funding SDIO will require for advanced technology development of technologies (tech base) not used in Phase I, but which will be needed to support Phase I?

If it is not included in the answer to the above question, what is the estimated total cost of full-scale engineering development of Phase II? Similarly, what is the total cost of demonstration/validation of Phase III? What is your estimate of the total funding SDI will require between now and the time Phase I is fully deployed?

General MONAHAN. Some advanced technology development activities currently underway or planned by SDIO have specific impact on Phase I development. Some examples include survivability advancements, sensor technology refinements, etc. Because of schedule changes due to fiscal constraints it is difficult to determine how specific breakthroughs may affect Phase I, therefore it is not feasible to determine exactly what portion of technology base funding applies to Phase I.

Although several alternative concepts are currently under study, none have been identified concretely as "Phase II". To date there is insufficient technical, architecture and cost data to say with confidence what a hypothetical later phase of the SDS, be it II or III, might cost.

QUESTIONS SUBMITTED BY SENATOR CARL LEVIN

DEPLOYING AN SDI SYSTEM

Senator LEVIN. General Herres, in your opinion, should the U.S. commit itself now to deploy an SDI system and abrogate the ABM Treaty as soon as we have the capability?

General HERRES. I believe that we should proceed with Phase I of SDI as soon as it is technically feasible and fiscally affordable. This is not possible today because the program is still in the demonstration/validation phase of its development. More work is still needed to reduce technical risk and find specific solutions which are affordable. I am confident that the day will come when deployment is feasible, and when it does, we should modify or nullify the ABM Treaty. It is rather pointless to commit billions of taxpayers' dollars to a system you don't intend to deploy. I do not, however, advocate repudiating the ABM Treaty at this time, since we are still too far away from a deployment decision.

MILITARY ROLE TO SDI SYSTEM

Senator LEVIN. General Herres, what military capability or role would you require for an SDI system that would justify the abrogation of the ABM Treaty?

General HERRES. An SDI system should offer both deterrence and protection capabilities. As a deterrent, SDI will complement, but not replace, the role strategic offensive forces play today. Defenses will complicate an aggressor's attack planning and, therefore, create additional uncertainties in his mind that his attack will succeed. This will cause any rational aggressor to rethink whether an attack is beneficial to his country. Offensive forces will still be necessary to not only limit damage to the United States by destroying an enemy's weapons prior to launch, but also to provide the threat of retaliation. Without it, there would be no incentive to stop attacking the United States. A BMD system can also protect the United States and its allies from attacks of limited size, whether intentional or unintentional. Offensive forces do not offer this capability. There are too few interceptors in the Phase I architecture, however, to defend any specific set of targets against a major Soviet attack for more than a short period of time.

CAPABILITY TO JUSTIFY SDI DEPLOYMENT

Senator LEVIN. Mr. Wolfowitz, will you define the capability that would justify SDI deployment and abrogation of the ABM Treaty?

Mr. WOLFOWITZ. We have previously identified the Phase I Strategic Defense System (SDS) as the first major strategic defense deployment step that would provide a militarily useful contribution to deterrence. The JCS formally provided operational requirements for Phase I SDS in June 1987. The performance standard for the first phase SDS is based on the reality that ballistic missile defense, in concert with our offensive forces, can significantly enhance deterrence. This does not mean a first phase system would defend only military targets; it does mean that the layered defense concept that is fundamental to SDI would provide greater assurance that we can prevent nuclear war from ever occurring.

The detailed JCS requirements for Phase I were addressed in General Herres testimony earlier in the hearing, as well as in the classified version of the 1989 Report to Congress on SDI.

EFFECTIVENESS AGAINST COUNTERMEASURES

Senator LEVIN. Would such a system be effective against countermeasures such as fast burn boosters and decoys, and other weapons such as ASATS, depressed trajectory SLBMs, bombers or cruise missiles?

Mr. WOLFOWITZ. The Phase I SDS architecture takes into account likely Soviet countermeasures and U.S. survivability and effectiveness measures. The Soviets may very well take steps to try to reduce the effectiveness of any U.S. defensive deployments. We will consider, in our evaluation of options generated by SDI research, the degree to which certain types of defensive systems, by their nature, encourage an adversary to attempt to overwhelm them with additional offensive capability while other systems can discourage such a counter effort. We seek defensive options—as with other military systems—that are able to maintain capability more easily than countermeasures could be taken to try to defeat them.

SDS is designed to defend against the greatest threat—ballistic missiles. Effective air defenses would complement and complete defenses against ballistic missiles.

BRILLIANT PEBBLES

Senator LEVIN. General Monahan, how effective do you believe the Brilliant Pebbles system would be against the present Soviet ballistic missile threat?

General MONAHAN. SDIO is considering the Brilliant Pebbles in the context of a multi-layer architecture that would employ a ground-based interceptor tier to meet effectiveness requirements. Brilliant Pebbles is a technology program to provide re-

search for an integrated sensor and interceptor system. Brilliant Pebbles is judged to have a comparable effectiveness to other space-based interceptors against the present Soviet ballistic missile threat. Brilliant Pebbles offers other potential benefits such as low cost, survivability enhancements, and robust operation. SDIO is currently assessing the Brilliant Pebbles design, concepts, and related costs to meet performance goals.

BRILLIANT PEBBLES EFFECTIVENESS

Senator LEVIN. How effective would it be against Soviet ballistic missiles that employed countermeasures such as fast burn boosters and large numbers of decoys?

General MONAHAN. Countermeasures are being considered as part of the Brilliant Pebbles assessments. These countermeasures are considered in conjunction with counter-countermeasures employed with respect to the Brilliant Pebbles. SDIO is continuing this assessment of countermeasures through a red/blue team process that should yield valuable insight into not only the countermeasures effectiveness, but to the expected costs to the Soviets for such countermeasures.

DEFENSIVE TECHNOLOGIES

Senator LEVIN. What is your assessment of the Soviet's efforts and intentions regarding defensive technologies? (General Herres stated in February that the Soviets are not "ready to support a defensive technology arms race.")

General MONAHAN. During the past decade alone, the Soviets allocated resources equivalent to about \$20 billion per year for active and passive defensive programs. Results of this effort include: an anti-aircraft defense that far exceeds anything the West possesses; ABM defenses around Moscow that are currently being modernized to include a new two-tiered system; anti-satellite capabilities such as the co-orbital system and the direct ascent capability of the GOLASH (ABM interceptor for the Moscow System); and a continuous and pervasive R&D effort to allow successive upgrades to existing systems, the fielding of follow-on systems, and the development of systems based new technologies involving kinetic and directed energy. In addition to these efforts, the Soviet Union has maintained an extensive passive defense program.

Despite outspending the United States in R&D, the Soviets remain behind in many key technology areas. The Soviets most noticeable weakness is in computers (hardware and software), sensors micro-miniaturization, and electronics. Extrapolation suggests that they are weakest in tracking, pointing, guidance and control, and battle management tasks. They are in a far better position regarding kill mechanisms and heavy machine manufacturing necessary for propulsion or structures. Manufacturing high-technology items lies at the core of Soviet technological problems. The Soviets can probably fabricate one or two of anything in the West. Their problem is that they cannot mass produce such items.

The Soviet leadership itself is very pragmatic about these technological deficiencies in relation to the West. Even their most optimistic predictions do not call for obtaining technological ascendancy over the West before the 21st century. Nevertheless, they are working to improve their indigenous capabilities to catch up with and surpass those of the West in basic weapons technologies. The Soviets seek to accomplish this goal by investing heavily in their own R&D base; General Secretary Gorbachev's program for economic reform calls for priorities in key high technology sectors of industry. The Soviets augment their indigenous capability by aggressively obtaining the best possible technology from any source and applying it to their military effort as quickly as possible—often much faster than their western counterparts.

Technological limitations undoubtedly prevent the Soviets from deploying defenses with the level of sophistication and capability envisioned for SDI. Nevertheless, the Soviets could take an approach, using their strength in weapon technologies such as missiles, radar and command guidance, space launch capabilities, and even high-powered directed energy devices. While this would overcome some of their limitations and could have the appearance of a formidable defense, it would necessitate greater proliferation, greater reliance on ground-based and terminal defenses, and probably would still present the Soviets with difficulties in performing discrimination and in overcoming the complexities of managing the coordination of many platforms and facilities.

OTA CLAIMS

Senator LEVIN. How do you respond to the OTA claims that "there would be a significant probability that the first (and presumably only) time a BMD system were used in real war, it would suffer a catastrophic failure" and "no adequate models for the deployment, production, testing and maintenance of software for full-scale BMD systems exist"?

General MONAHAN. SDIO takes strong exception to the statement that the first use of a BMD system in real war would result in a catastrophic failure. Other studies by experts have concluded that the battle management problem can be solved. Careful design and extensive testing in peacetime against real and simulated targets will provide a high degree of confidence in the system's performance under actual battle conditions.

Contrary to the OTA report's assertion, models do exist for the development and testing of software. The assumption that strategic defense software cannot be tested short of war is at variance with several decades of testing strategic warning hardware and software. Strategic software is in fact tested every day, as are other software systems of the magnitude of the initial level under discussion. The operational requirements for the job of battle management, command, control, and communications are being used for many military systems today.

BRILLIANT PEBBLES

Senator LEVIN. Do we have well-developed, reliable models for the management of Brilliant Pebbles? How would the thousands of individual pebbles communicate with each other in deciding which targets each would try to attack?

General MONAHAN. Brilliant Pebbles battle management techniques have been outlined and their relative effectiveness and constraints are understood. The battle management strategy for Brilliant Pebbles is to employ a methodology to allow differing levels of control. Control would include centralized, coordinated operation evolving through autonomous operation. Each strategy would include "man-in-the-loop" and incorporate specific rules of engagement. These operations have been modeled and associated operational and performance considerations are being addressed as part of the overall research program.

MODIFYING START

Senator LEVIN. General Herres, it was reported last week that the JCS proposed that the U.S. modify its present START negotiating position with regard to the ABM Treaty. The position that President Reagan supported called for the United States and Soviets to adhere to the treaty for 10 years. After this period of time each side would be free to deploy missile defense unconstrained by the terms of the treaty. As I understand the JCS proposal, it would change our position by dropping our insistence that either side have the right to eventually deploy extensive ballistic missile defenses.

Will you tell us why the JCS proposed this modification? What benefits would it provide for U.S. national security and first strike stability?

General HERRES. Notwithstanding media reports, the Joint Chiefs of Staff do not challenge the right to eventually deploy ballistic missile defenses; it appears the reporters drew such conclusions on their own. On the other hand, there could be cause for concern if the current negotiating position is interpreted as predicting a withdrawal from the ABM Treaty at a date specified in the future. The Chiefs feel it would be more prudent to withhold the decision to withdraw until SDI proves feasible through research, development and testing, and remain within the ABM Treaty regime until a conscious decision is made to depart it, with full regard to political, fiscal, and strategic considerations that exist at that time.

Senator LEVIN. General Herres, why was the JCS proposal not accepted during the NSC meeting last week? Is it still possible that the President may accept it?

General HERRES. The decision was made to enter this round of negotiations with the U.S. position unchanged from previous rounds. Any further speculation on the outcome of any future decision processes is premature.

SDI MAKING OFFENSIVE RETALIATORY DETERRENCE UNNECESSARY

Senator LEVIN. General Herres, do you foresee SDI as making offensive retaliatory deterrence unnecessary? Would we be more secure with mutual deployment of imperfect defenses or would the deployment of limited ballistic missile defenses provide an incentive for one side to strike first in a crisis?

General HERRES. The SDI is a research program designed to permit an informed decision on strategic defenses. It has never been a program to replace strategic defenses. If the research yields the appropriate results, we should seek to move forward in a manner than enhances U.S. security and stability. I can foresee no circumstance under which an appropriately designed and deployed ballistic missile defense would provide an incentive for one side to strike first in a crisis.

ABM TREATY INTERPRETATION

Senator LEVIN. Mr. Wolfowitz, will you tell us what the position of this administration is with regard to the interpretation of the ABM Treaty? Does it accept the restrictive (as originally written) or broad interpretation?

Mr. WOLFOWITZ. The broad interpretation of the ABM Treaty is fully justified. However, the SDI program continues to be carried out in a manner which does not conflict with what is called the restrictive interpretation of the ABM Treaty. Should our plans in this regard change, we would consult with the Congress and request its approval through normal budgetary procedures.

CLARIFYING GRAY AREAS WITH THE SOVIETS

Senator LEVIN. What efforts is the administration making to clarify some of the gray areas of the treaty, such as arriving at precise definitions for terms like "development," "test," and "component"? Would we seek to clarify these gray areas in collaboration with the Soviets or make unilateral declarations of our understanding?

Mr. WOLFOWITZ. It is hard to see any advantage for the United States to engage the Soviets in the Defense and Space Talks on this point. We already know from past Soviet statements and unswerving opposition to SDI that they would not seek to "clarify" the ABM Treaty, but would try to limit to the greatest extent possible what we could do in SDI.

QUESTIONS SUBMITTED BY SENATOR MALCOLM WALLOP

PHASE I ARCHITECTURE

Senator WALLOP. Why is there no terminal phase layer in the Phase I architecture? It would seem that one of the most effective ways to handle the discrimination problem would be to let the atmosphere filter out the light-weight decoys. They would also allow for the defense of highly valuable targets, such as C³ nodes. I believe it is true that today's terminal phase interceptors, such as the HEDI which will be tested later this year at White Sands, do not have the significant limitations of their predecessors: they have a much wider footprint, they have a faster response time which gives them a shoot-look-shoot capability, and they do not use nuclear kill mechanisms. Is there a possibility that some terminal phase interceptor will be added to the Phase I architecture in the near future?

General MONAHAN. The value of a terminal phase layer has always been recognized when considering a mature and robust Strategic Defense System architecture. Several reasons contributing to Phase I not having such a terminal layer are as follows:

When Phase I architecture was defined, terminal tier candidate elements were not sufficiently mature technologically to be available for the Phase I deployment time frame;

The early defendable battlespace and ground area were greatly limited, which would have shifted the orientation of the architecture towards a point defense rather than the desired total CONUS area defense;

The terminal tier was originally linked to its own unique requirement for a separate terminal imaging radar whose cost was not consistent with the other sensor and interceptor elements of Phase I.

A continuing effort is being made to reexamine and reanalyze the concept and the elements as they mature to insure that a most cost-effective Phase I architecture is realized. It is important that the best architectural foundation be laid in Phase I that can lead to an optimum and robust Strategic Defense System. HEDI has long been considered to be a primary early follow-on candidate to the Phase I architecture. Because of its rapidly maturing nature, both technically and conceptually, it will continue to be evaluated under the cost-effective criteria for its contribution and potential addition to a Phase I architecture.

SDI PROGRAM SLIPPAGE

Senator WALLOP. General Monahan, would you please give me an explanation of why every component of the SDI program was slipped by 2 years in the current reprogramming? It seems to me that while this may be a politically acceptable thing to do, it avoids making any decisions about which technologies are most promising or which are most mature? Couldn't some of these decisions have been made this year? At some point, if the funding for the program continues to erode as it has in recent years, how will it be possible to maintain a balance between Phase I and later technologies and still keep to any predictable deployment schedule for strategic defenses?

General MONAHAN. In the current reprogramming, an attempt was made to preserve an appropriate balance between research supporting an initial strategic defense system and a technology base for follow on systems. To accomplish this balance, the plans for validation of initial system elements now show a slip of approximately 2 years. However, this does not mean we are precluding emphasis on technology that is most promising in nature. On the contrary, we are pursuing efforts such as space based interceptor concepts for Brilliant Pebbles which if successful, could accelerate the validation of this system element.

BMD MISSION

Senator WALLOP. General Piotrowski, as I understand it, Space Command has been assigned the BMD mission among its many other important functions. Obviously, today you have no weapons with which to perform that mission. But would you please tell me how important you regard BMD in terms of the other functions and missions of Space Command.

General PIOTROWSKI. Planning and developing requirements for ballistic missile defense (BMD) is a high priority within my command. I believe this responsibility can be carried out to the benefit of all U.S. Space Command missions.

The U.S. Space Command provides missile warning and space surveillance data to all warfighting Commanders in Chief for use in their Attack Assessment responsibilities. Today we can detect, track, and identify a ballistic missile attack with an extremely high degree of confidence. But, America is completely without the resources to complete the logical next steps of missile engagement and kill assessment. This critical missing link in our strategic defense posture leaves the U.S. no option but to continue relying on mutual vulnerability for deterrence. I foresee the U.S. Space Command Tactical Warning and Attack Assessment (detection, tracking, and identification) mission as being the operational point from which to evolve a ballistic missile defense system.

The collateral benefits of a BMD system to other U.S. Space Command missions are many fold. The Boost Surveillance and Tracking System (BSTS) will improve the accuracy, coverage, availability, and timeliness of our space-based Defense Support Program satellites used for detecting worldwide launches, which is a very reliable system today. Foreign satellite launches and ballistic missile tests will be detected and identified earlier, and most importantly the stereo tracking capability of BSTS will provide improved assessment of new foreign satellite launch orbits. The survivability enhancements built into the BSTS will assure continued operation of this critical surveillance system throughout the spectrum of warfare.

The Space Surveillance and Tracking System (an element of the Phase I BMD architecture of mid-course tracking and discrimination) will provide a tremendous enhancement to our mission of space surveillance. It will fill many coverage gaps we currently have, reduce our dependence on overseas basing of space radars, be able to detect satellite maneuvers, and provide surveillance of satellites and debris over the Southern hemisphere where we have no coverage today.

The Ground Based Radars (GBR) would greatly increase our catalog maintenance and space surveillance capabilities for small objects in low earth orbits. The GBR would also provide an excellent capability for determining size, shape, and orientation of foreign satellites, thus increasing our ability to quickly assess the mission of the satellites. In addition, the GBRs would provide an excellent capability to detect maneuvers of resident low orbit space objects.

Space Based Interceptor (SBI) and Exoatmospheric Reentry Vehicle Interception System (ERIS), both Phase 1 components, potentially have Anti-Satellite capabilities. In addition, SBIs could be used in a theater missile defense role to negate ballistic missiles in support of theater CINCs or to support allies during Third World conflicts involving ballistic missiles.

The modern decision aids and survivable secure communications incorporated in a BMD system will improve the current U.S. SPACECOM command structure. A con-

solidated command center developed with Strategic Defense Initiative technology for BMD would be used to detect, assess, and make decisions regarding the integrated strategic (air, space, and ballistic missile attack) threat to North America.

The inherent benefits of a deployed BMD make it integral to future enhancements to our national defense posture. Planning and developing requirements for a ballistic missile defense system is and will continue to be a priority for the U.S. Space Command.

[Whereupon, at 3:49 p.m., the subcommittee was adjourned.]

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